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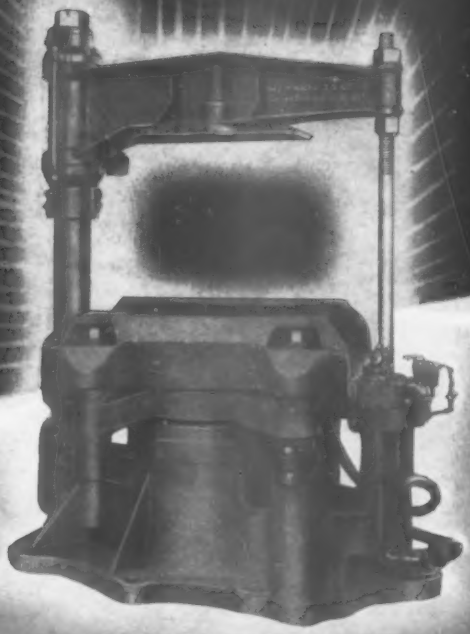
THE FOUNDRY

wherever metals are cast...

The 37th YEAR OF NICHOLLS' *Service to the Foundry Industry*



No. 18-44 Type "K" Heavy Duty Jolt & Power Squeezer with pneumatic pattern draw and open end frame — equipped with parallel squeeze head.

★ It is the belief here at NICHOLLS that industry faces the greatest opportunities in history. Your past support inspires us to strengthen our efforts to maintain the leadership you have played such an important part in helping us achieve.

WM. H. NICHOLLS CO., Inc.

RICHMOND HILL (18) · LONG ISLAND · NEW YORK

Foreign Manufacturers and Selling Agents—

99% pure fused soda ash molded into 2-lb. pigs, PURITE is easy-to-use and effective in action. Pigs are simply added to ladle or cupola by count. No weighing or measuring. No loss or dust. PURITE is safe and economical to use.

SHIPPED IN 100-LB. BAGS AND BULK CARLOADS

IMPROVE STRENGTH and MACHINABILITY OF CASTINGS

For better cupola operations with hotter metal and less oxidation of the iron and metalloids in the charge, use Purite. This scientific flux removes impurities and prevents segregation defects. In both cupola and ladle, Purite increases the fluidity and pouring qualities of the molten metal, speeding production of sounder castings.

Ask your foundry supply house for a copy of Mathieson Bulletin P-41, "Refining and Desulphurizing Cupola Iron with Purite."

PURITE

99% PURE FUSED SODA ASH

THE SCIENTIFIC FLUX FOR BETTER MELTING & CLEANER IRON

Mathieson

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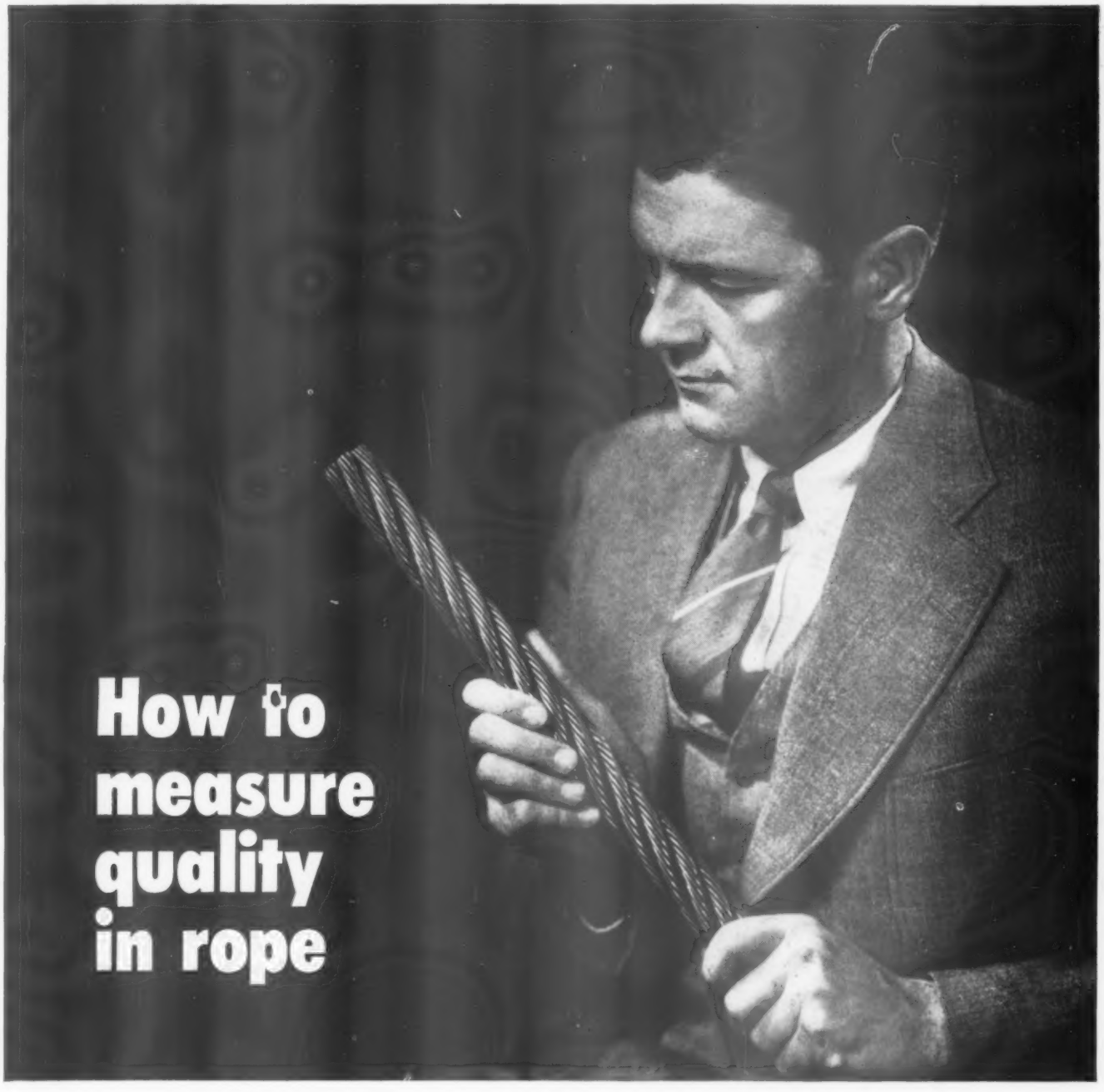
THE MATHIESON ALKALI WORKS (INC.)
60 EAST 42nd STREET, NEW YORK 17, N. Y.
(Licensees of Metallurgical Development Company, Inc.)



A *good* wire rope has the reserve strength to handle your heaviest foundry loads with safety.

A *good* wire rope has the guts and endurance that mean long life—hence fewer replacements.

A *good* wire rope has the proper flexibility for use on your ladle cranes and other hoisting machines.

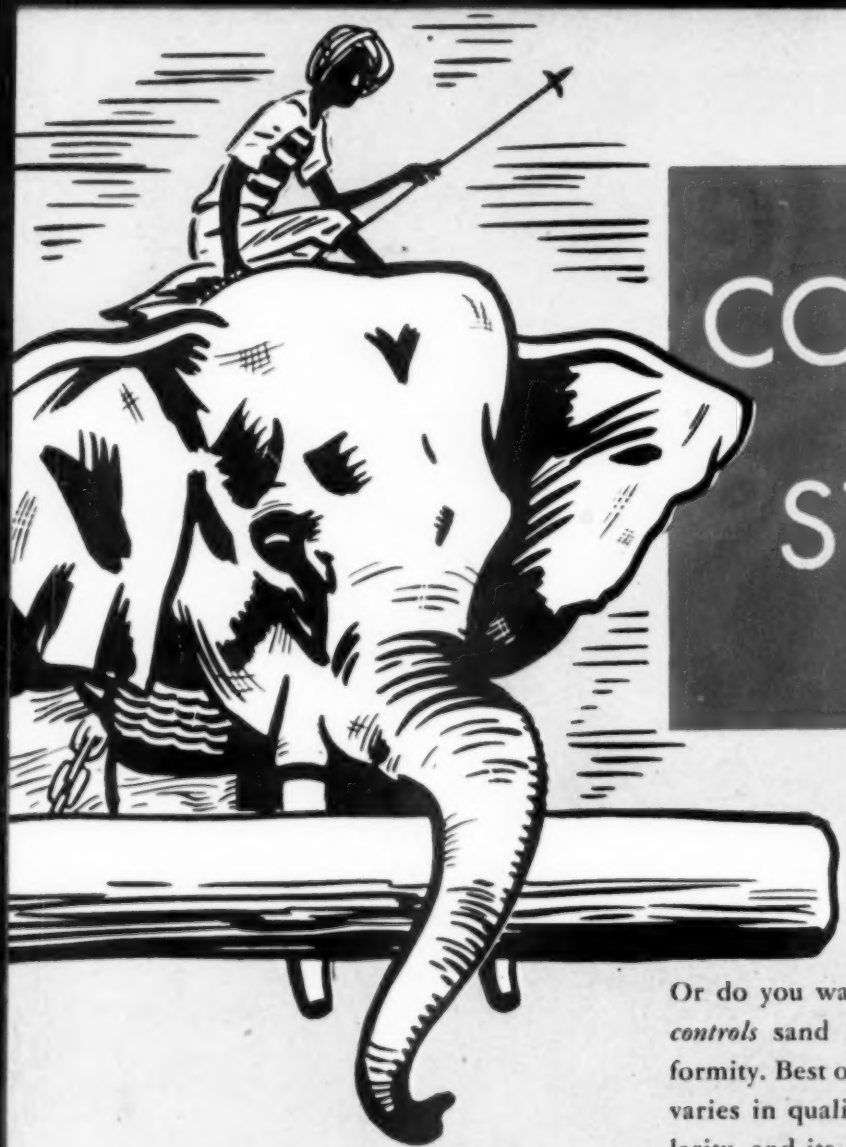
A *good* wire rope is a source of satisfaction . . . because it performs as you want it to perform.

Bethlehem's Purple Strand meets all these requirements. It is a *good* wire rope by every measure of quality.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

When you think WIRE ROPE . . . think BETHLEHEM



CONTROLLED STRENGTH

FEDERAL GREEN BOND imparts strength to foundry sand—but the degree of this strength can be limited by the degree of the mix. Do you want a firm, stable sand? Do you want a sand that collapses readily and flows freely? Or do you want a sand strength in between? GREEN BOND *controls* sand strength. Foundrymen everywhere hail its uniformity. Best of the Bentonites, FEDERAL GREEN BOND never varies in quality or performance. Its strength lies in its popularity, and its popularity lies in its strength.

F E D E R A L

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The Best of the Bentonites

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THE FOUNDRY

for JANUARY 1947

VOLUME 75 NUMBER 1

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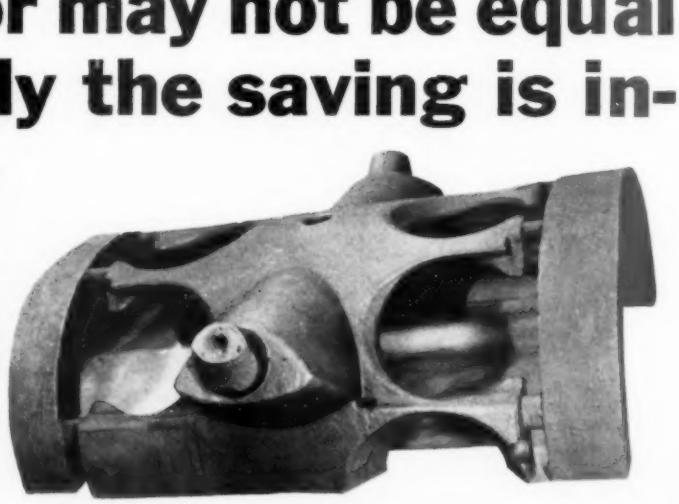
Life is too short, skilled labor too scarce, and productive foundry hours too precious to gamble with by using supplies that may or may not be equal to the best. Usually the saving is infinitesimal and the conclusion, "penny wise and pound foolish." • • •



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LINOIL CORES FOR BIG WORK MEAN SUCCESSFUL CASTINGS

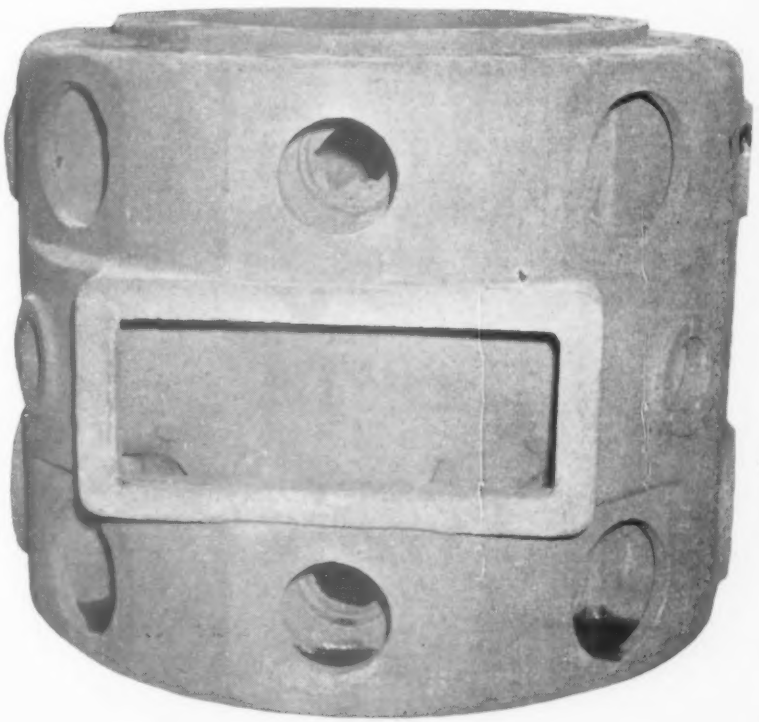
Canadian Ingersoll-Rand Company, Ltd. Sherbrooke, Quebec

They choose Linoil as efficient economical and dependable in making intricate cores for heavy

LINOIL

castings. Losses due to cores practically nil. Easy cleaning is a factor of prime importance.

In both Canada and the United States Linoil is used by many foundries. In fact, it might be difficult to find many of the larger or more prominent foundries that are not using it. The point is that these foundries have found by experience how reliable the company is and how completely the Werner G. Smith oils have been developed to meet foundry needs. There is much to be said for specialization. Fortunately, the quality of core oil is not a matter of opinion or imagination but is something that can be factually tested by any foundryman. You can test Linoil conclusively on these points. (1) High ratio of sand. (2) Workability on bench or blower. (3) Agreeableness to all workers. (4) Drying time. (5) Increased percentage of perfect castings. (6) Ease of cleaning out burned cores. You should test Linoil yourself on all of these points because the number and prominence of the foundries using Linoil is strong indication that you will find something to your profit. A trial drum will show you.

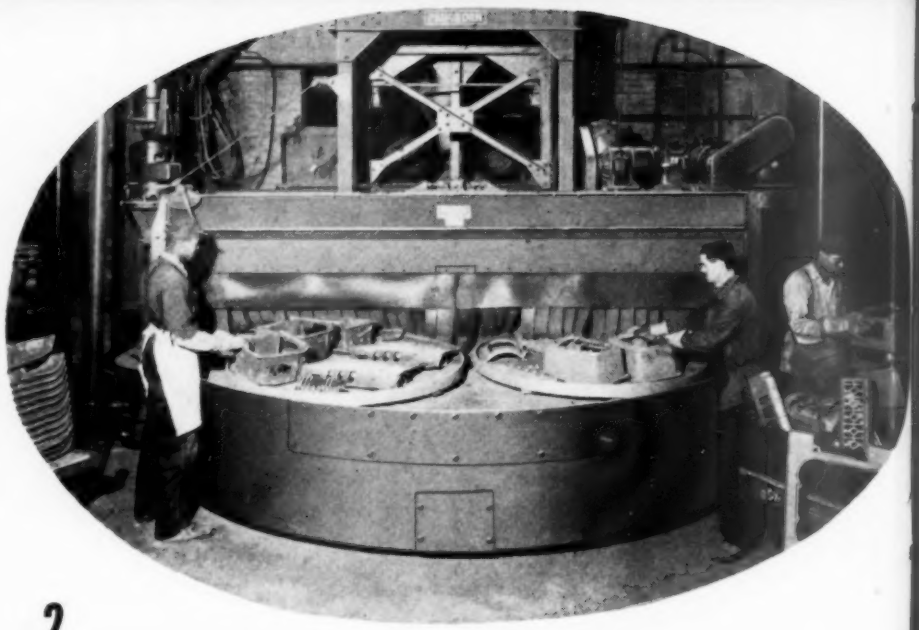


SMITH COMPANY

DANIELS - MIDLAND COMPANY)

4690 CLEVELAND 2, OHIO

1 . . . The popular ROTOBLAST® unit pictured above is standard Pangborn equipment on all rocker BARRELS, Rotary TABLES and Special CABINET Machines.



2

Pangborn

Blast Cleans Cheaper with the right equipment for every job

2 . . . ROTOBLAST CLEANING TABLE for Airless Blast Cleaning of Flat and Fragile Work or Unusual Shapes. Pangborn ROTOBLAST Table directs the blast stream onto the work, cleaning vertical and horizontal surfaces at the same time, giving all planes equal cleaning. Single-spindle tables: 6, 8, 12 and 14 ft. diam. Multiple-spindle tables: seven standard sizes from 4 ft. to 14 ft. diam., with auxiliary tables from 14 in. to 5 ft.

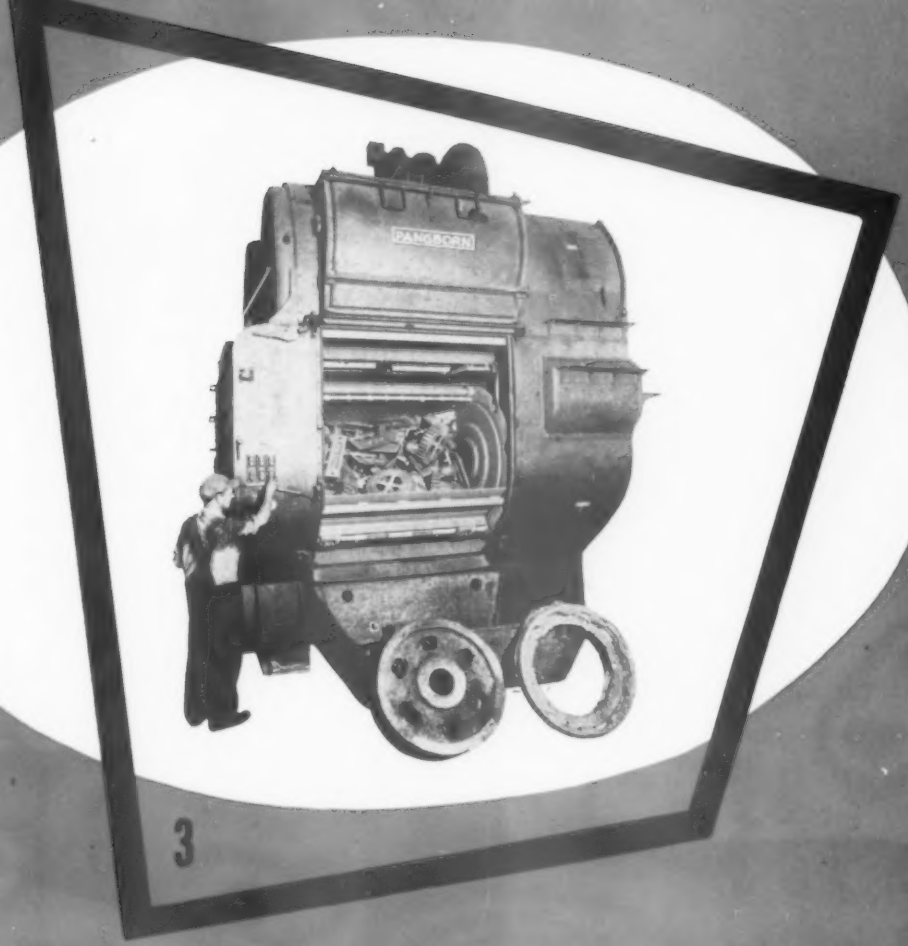
3 . . . ROTOBLAST ROCKER TYPE BARREL for Airless Blast Cleaning of Work Handled in Batches. Pangborn ROTOBLAST Rocker Barrel has exclusive Abrasive Separator and Cleaning System which restores usable abrasive to original cleanliness and efficiency by stratification and pneumatic handling. Six standard sizes.

4 . . . AIRLESS Cleaning Equipment, Custom Designed. Pangborn Special ROTOBLAST Machines are individually designed for automatic cleaning of work which cannot be handled by tables or barrels. Over 40 years of blast cleaning experience is put to work on the design of these machines to fit individual requirements.

One large automobile foundry is using three of these special machines for cleaning cylinder blocks at the rate of 750 per hour. Cleaning costs are lowered 40% to 60%.

5 . . . Air Blast Cleaning. Pangborn also manufactures a complete line of air blast cleaning equipment, including blast tanks, cabinets, rooms and special machines.

To *blast clean cheaper*, Pangborn supplies the right type of air or airless equipment for every job. For complete information on how Pangborn equipment can increase your profits — by cutting blast cleaning costs, reducing machining time, facilitating inspection, improving quality, etc., write to Pangborn, *world's largest manufacturer of blast cleaning and dust control equipment.* Pangborn Corporation, 1300 Pangborn Boulevard, Hagerstown, Maryland.



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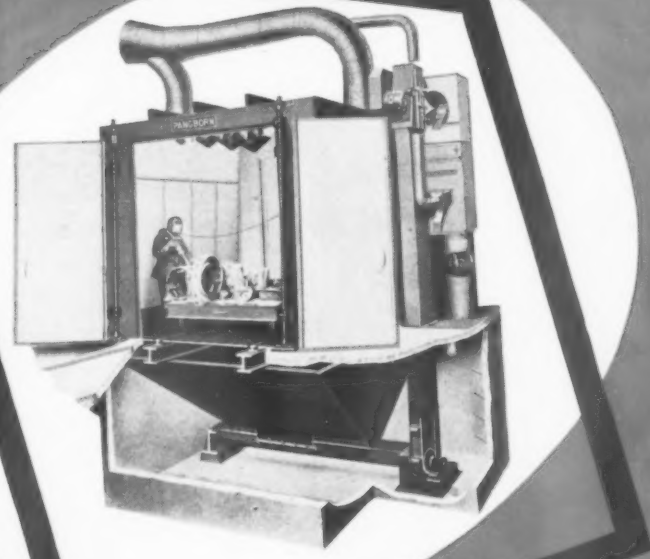


5

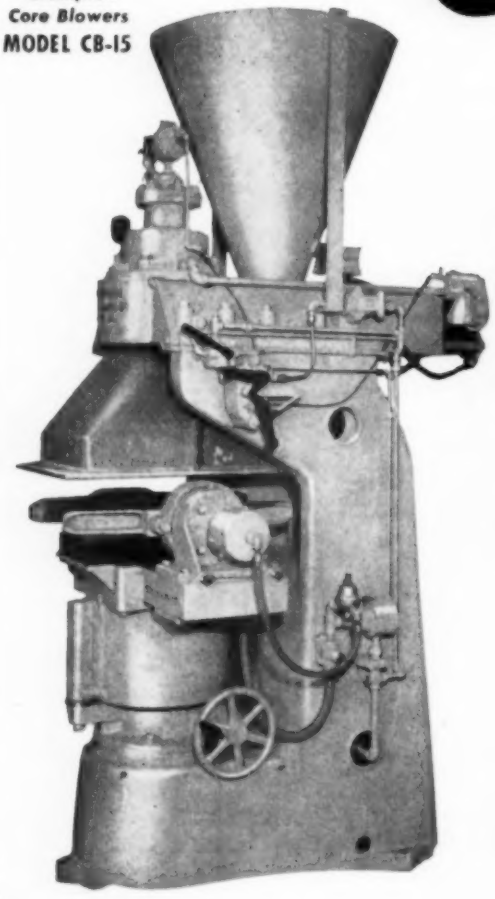
4

Pangborn

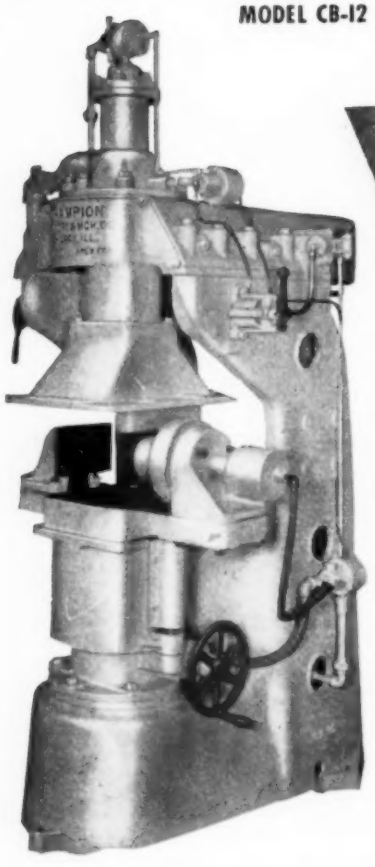
PANGBORN CORPORATION HAGERSTOWN MARYLAND

FOUNDRYMEN from Coast to Coast are thrilled by CHAMPION "Know-How"

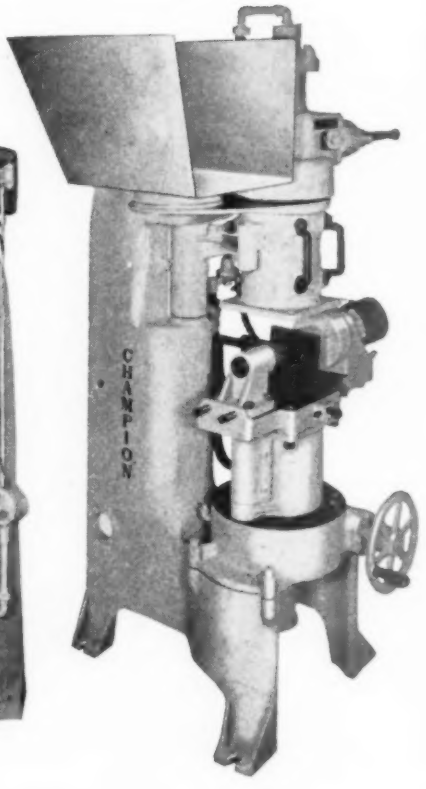
Champion
Core Blowers
MODEL CB-15



Champion
Core Blowers
MODEL CB-12



Champion
Core Blowers
MODEL CB-8

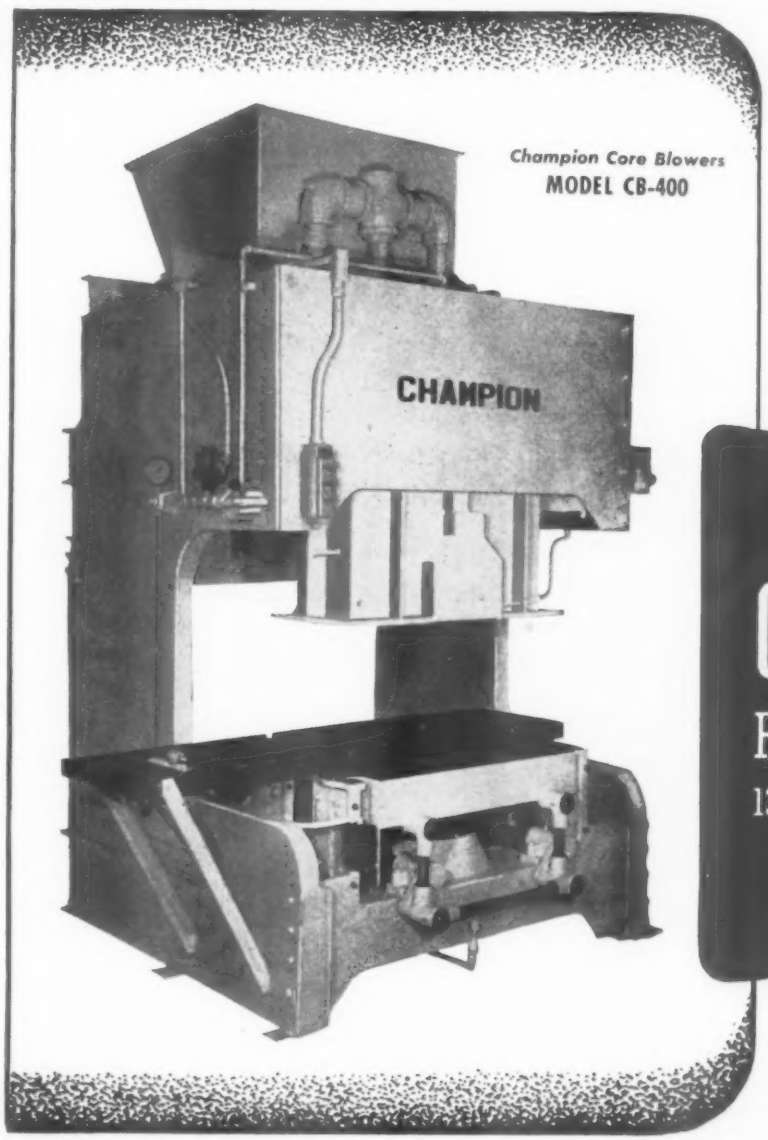


Performance under the stress and strain of today's demand for accelerated production of perfectly rammed cores is the test of a true Champion—a top-notch tool with the "know how" or "savvy" to remove all guesswork.

That is how a Champion Core Blower performs for the least experienced operator. Any man or woman—boy or girl can produce perfectly rammed cores on a Champion Core Blower by merely setting the box and pulling the lever. In a single second small or large cores are perfectly rammed. The working table is completely accessible with no obstructions, so that cores are produced faster, more economically and more accurately without need for highly trained labor.

A single valve operates the core box clamp, clamps same against the blow plate, blows the core, exhausts and releases the clamps in the proper cycle. Rigid one-piece, cast steel frame insures accurate alignment of core box and blow plate. Patented Air-Operated Hydraulic Clamp locks the core box securely against split box separation.

Champion Core Blowers could be the answer to that most puzzling problem of man-power.



CHAMPION
FOUNDRY & MACHINE CO.
1318 West 21st Street Chicago 8, Illinois

Here's Headline News!

DELTA

PERMI-BOND

THE MODERN, SCIENTIFIC SEA COAL REPLACEMENT

...now used in many of the NATION'S LEADING FOUNDRIES

Delta Permi-Bond is a specially prepared pure hydrocarbon, completely volatile at elevated temperatures. It decomposes to form a vapor-gas cushion, which is reducing in nature, and leaves only a trace (two tenths of 1% maximum) of ash.

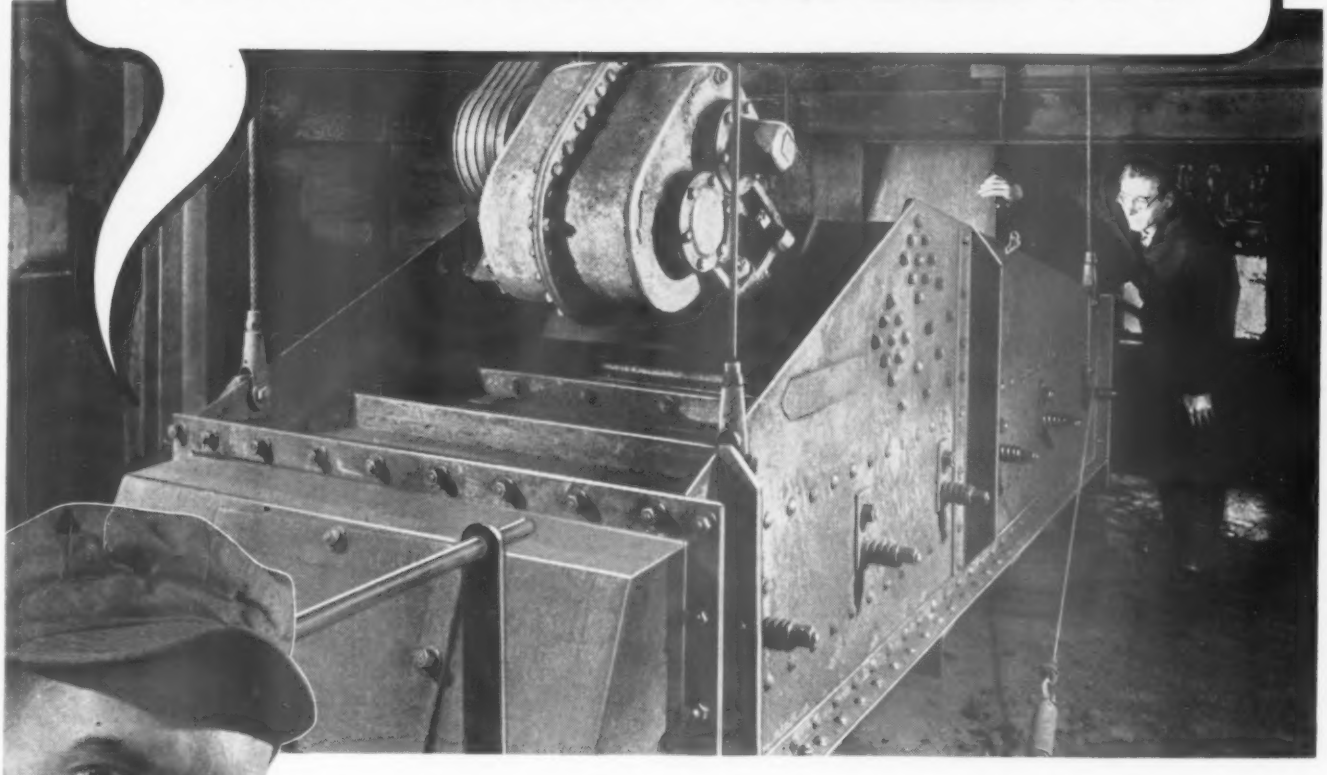
Note these important advantages and SEND FOR A LIBERAL SAMPLE. You will also receive complete information on HOW TO USE DELTA PERMI-BOND in your foundry:

1. Always uniform. Manufactured under rigid chemical and physical control.
2. Eliminates ash and free carbon which contaminate your sand.
3. Greatly reduces gas, smoke, soot and dirt in the foundry.
4. Provides correct amount of vapor gas in the mold cavity, which prevents casting blows and also allows use of lower permeability sand.
5. Increases dry strength of sand 75% to 90%.
6. Prevents scabbing, buckling, rat-tailing and cutting which greatly reduce scrap castings.
7. Improves casting finish, which cuts cleaning room costs to a minimum.
8. More economical to use; reduces your sand costs.
9. Much cleaner and more foolproof to use than sea coal.

DELTA OIL PRODUCTS CO.

Manufacturers of **FOUNDRY PRODUCTS,**
Industrial and Automotive Oils, Greases and Compounds
MILWAUKEE 9, WISCONSIN

"I Chose Allis-Chalmers 'Low-Head' Screen . . .



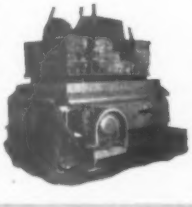
A-C Builds Basic Machines, Blowers, Pumps, Drives, Electrical Equipment For Foundries!

It's One of Four Basic Types of Vibrating Screens Allis-Chalmers Builds for Foundries!"

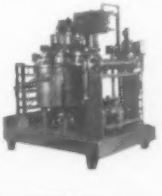
BUYER'S CHOICE—that's what you get in A-C's *complete* foundry screen line. Inclined and horizontal designs for wet or dry screening . . . for aerating sand after mulling . . . for screening shakeout sand . . . for removal of refuse from new sand.

And, in A-C's 4 screens, Utah Electric — Aero-Vibe — Ripl-Flo and Low-Head, will be found such features as: Stress relieving of all-welded screen body in giant annealing furnaces; High tensile strength alloy steel construction up to 50% stronger . . . reducing overall weight . . . cutting power requirements. And you can get a factory-matched Allis-Chalmers motor and Texrope drive.

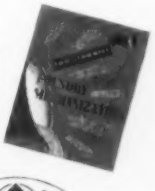
In its huge foundries, A-C pioneered the use of screens, casting washers and other advancements in your industry. A call to your A-C Sales Office will bring a foundry expert to your desk. ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 2151



FAMOUS "FOUNDROMATIC" 2-bearing shakeouts in single sizes to handle up to 25 tons. Series and parallel combinations can be arranged for even heavier loads.



MERCURY ARC RECTIFIERS for induction melting of ferrous and non-ferrous metals. Above unit rated 300 kw. Will melt approximately 1000 lb of steel—2000 lb of brass.



SEND FOR NEW BULLETIN 07B6092A, "Foundry Mechanization"— it's packed with helpful, usable information on the entire Allis-Chalmers line of Foundry equipment.

ALLIS·CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

1847 1947 A CENTURY OF SERVICE to Industry THAT MADE America Great

THE HOUGH Payloader

ESSENTIAL IN EVERY FOUNDRY!

Now, with rising production costs—price regulation—increased labor difficulties—you need a Hough Payloader more than ever before. For the speedy little Payloader can help step in and break the production bottleneck of material handling. It eliminates slow costly wheelbarrow crews—speeds up handling of core and moulding sand—assures continuous production and maximum foundry efficiency. One foundry saved over 5000 manhours of labor in a four month period—plus greatly increased production and lower costs.

The Payloader is built small but powerful—operates in congested areas, in narrow aisles, inside of bins or railroad cars—one man operated, it loads, carries and dumps—can pull trailers or handle castings with special lift fork; can be used for snow removal and general plant maintenance the year 'round.

Check up now on the many advantages the Payloader provides. Over 100 Foundries are now using Payloaders.

GET COMPLETE DETAILS

Send for this new catalog containing complete information, action pictures, mechanical details and specifications on the HA Payloader.

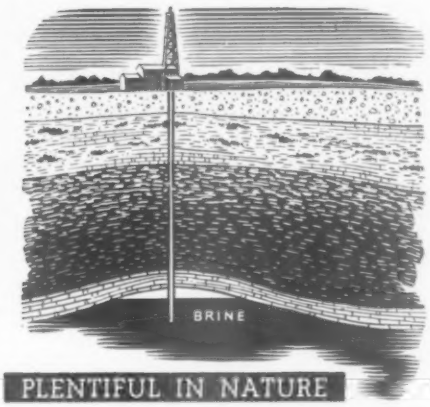
THE FRANK G. HOUGH CO.

MATERIAL HANDLING EQUIPMENT • LIBERTYVILLE, ILL.

THE STORY OF CALCIUM

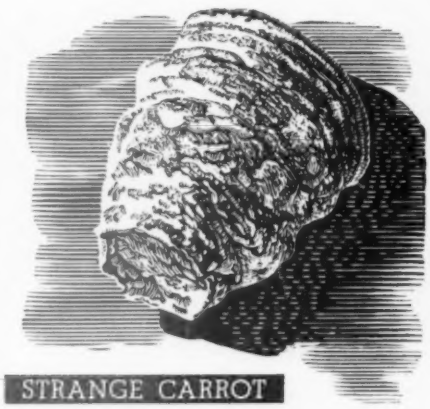
BEAUTY WITH UTILITY

1 Buildings of beauty from ancient times to the present day have been constructed of marble. Marble and limestone yield quicklime upon heating. In 1808 Sir Humphry Davy proved that quicklime is not an element but the oxide of a metal, which he named "calcium"—from "calx," Latin for "lime."



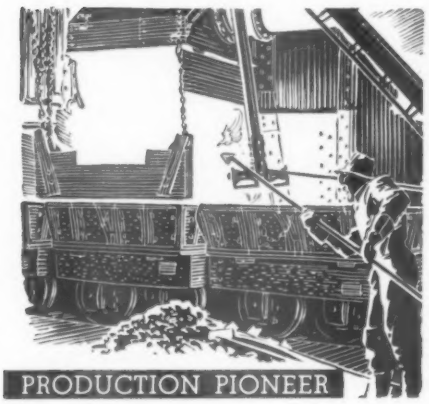
PLENTIFUL IN NATURE

2 Calcium does not occur in the free state, but its compounds are widely distributed—phosphates in bones, carbonates in pearls and coral. Deep brine wells such as found in Michigan are a source of calcium chloride, one of the raw materials available to Electromet for producing calcium metal.



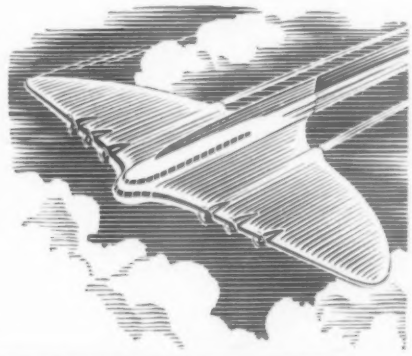
STRANGE CARROT

3 As it comes from the electrolytic cell, calcium metal looks like this "carrot." This soft white metal is extremely reactive. In metallurgy, because of this activity, calcium is used in the preparation of semi-rare metals, the deoxidation and cleansing of copper—and in the production of magnesium alloys.



PRODUCTION PIONEER

4 As early as 1896, a predecessor company of Union Carbide began commercial production of calcium carbide in electric furnaces, making possible the production of acetylene, and from it, many organic compounds. Now, the active calcium metal is also useful in organic syntheses.



ASSETS FOR THE FUTURE

5 Quality aircraft steels require steel of exceptional cleanliness. Calcium metal, as well as calcium alloys, are most efficient for the deoxidation and cleansing of these high-quality steels. Electromet calcium-silicon and calcium-manganese-silicon are eminently satisfactory for this purpose.

Years of Experience

. . . have given Electromet's metallurgists the "know-how" in the manufacture of high-quality steels. With our supply of calcium metal from France cut off by World War II, Electromet's newly developed calcium plant at Sault Ste. Marie went into operation, and now the United States produces many times as much calcium metal as was ever imported. Complete descriptions of Electromet products and service are contained in the booklet, "Electromet Ferro-Alloys and Metals", available by writing our Technical Service Department.

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.

ELECTROMET Ferro-Alloys and Metals are sold by Electro Metallurgical Sales Corporation and Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

Electromet
TRADE-MARK
Ferro-Alloys & Metals

We've Improved the

FOUNDRY GOGGLE

For Finer Fit
TWO SIZES
For Greater Comfort
A CORDUROY MASK BINDING

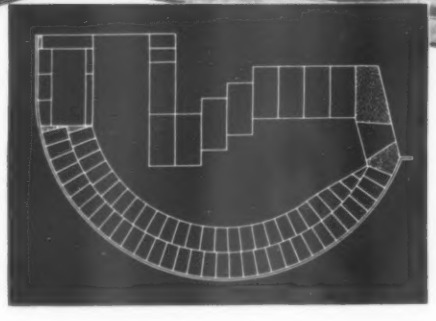
The A-O 305-50 (NFA) Foundry Goggle is now available in two sizes, #305 regular standard mask and #307, a smaller mask. Regular mask fits large faces and the small mask fits smaller faces. A corduroy binding extends around the entire edge of the soft leather mask for extra comfort and tight fit. 1-piece headband is easily adjustable. Wire screen ventilators around eyecups provide extra large area of ventilation. Sparks and flying objects cannot reach eyes. Available with Super Armorplate or 6 Curve Super Armorplate clear or calobar lenses in medium, dark or extra shades. Recommended for protection in such foundry work as melting, pouring, chipping, grinding, babbitting, riveting, hand tool operations and machine operations. Your nearest A-O Representative can supply you.

Safety Division American Optical COMPANY

SOUTHBRIDGE, MASSACHUSETTS. BRANCHES IN PRINCIPAL CITIES

SKLENAR FURNACES Set the Pace

AT A PROMINENT MID-WESTERN FOUNDRY THIS 1000 POUND SKLENAR FURNACE MELTS A 1200 POUND CHARGE OF NICKLE SILVER IN THE ASTOUNDING TIME OF ONLY 25 MINUTES!



YES SIR, in twenty-five minutes after charging, this organization is ready to pour perfectly melted metal into their molds. Indeed, Sklenar Non-Crucible, Direct Fired, Improved Reverberatory Melting Furnaces are the fastest melting furnaces built. This speed is achieved by their unique design, wherein metal is charged into a hopper which is also an exhaust from the combustion chamber. Here metal is preheated and melted at the throat of the hopper. Cold metal does not reach the molten bath. Charging is continuous. These furnaces are showing fuel savings up to 40% over former equipment, as the combustion chamber is heated by the same fuel used to melt the metal in the throat of the hopper.

Sklenar Furnaces are also equally efficient in the melting of GREY IRON, BRASS, BRONZE, ALUMINUM AND OTHER NON-FERROUS METALS. They are made in sizes to handle up to 10,000 pounds and may be fired by either gas or oil.

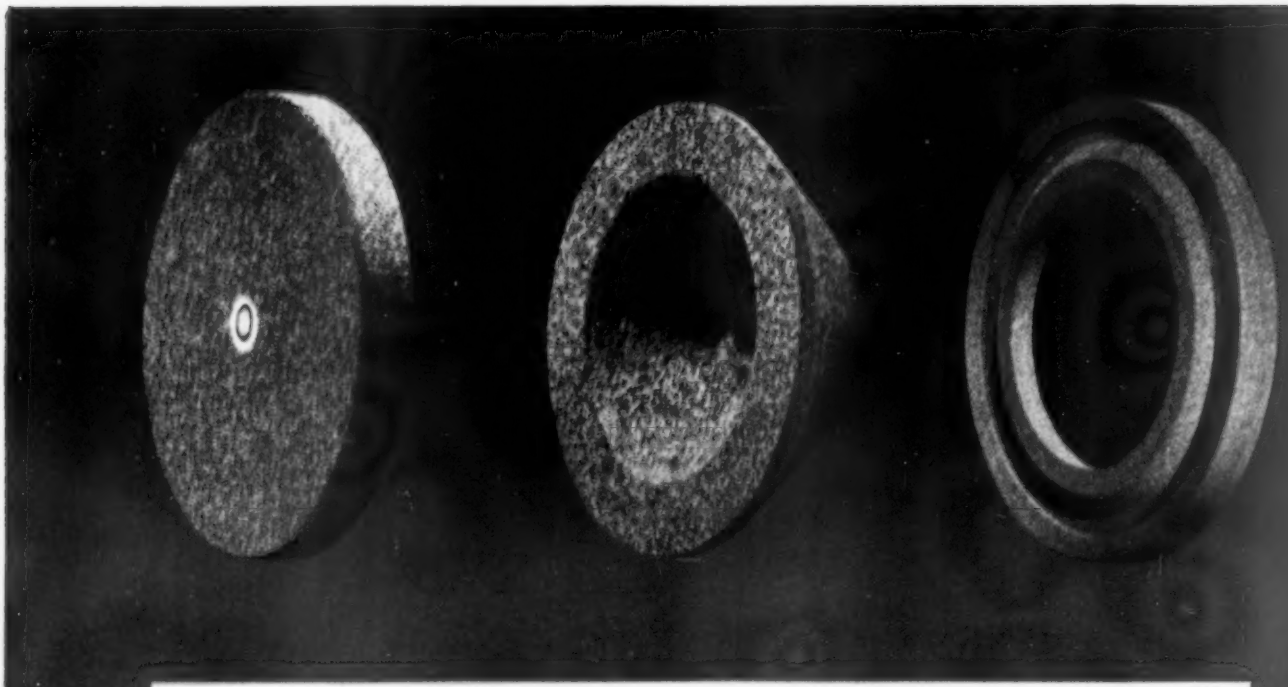
Also illustrated are two STROMAN CRUCIBLE STATIONARY MELTING FURNACES. These sturdy standbys are made in sizes to handle capacities from No. 20 to No. 400 Crucible. They melt brass, bronze, aluminum and other non-ferrous metals. They may be fired by either gas or oil.

FOR ANY TYPE OR SIZE OF NON-FERROUS MELTING FURNACES FOR FOUNDRIES, PERMANENT MOLD AND DIE CASTING PLANTS CONTACT STROMAN. THEIR ENGINEERS WILL GLADLY CONSULT WITH YOU ON ALL YOUR LAYOUT AND MELTING ROOM PROBLEMS.

STROMAN FURNACE & ENGINEERING CO.

DIVISION OF

THE PETERSEN OVEN CO. • 9900 FRANKLIN AVE. • FRANKLIN PARK, ILL.



Got time to think about grinding?

Is your grinding so perfect there's no chance for improvement?

Would you be willing to say your grinding costs could not be reduced?

Best way to find the answers is by taking time for a complete analysis of your grinding operations. Top production speed and low costs come only when you use the correct wheels and machines for your particular work.

Call in Peninsular engineers, specialists in this field for 58 years. They will completely study your machines, your grinding methods, the metals you grind. From their findings, they will develop grinding wheels that get the results you want.

Peninsular job-designed wheels can save money for you. *Every* Peninsular grinding wheel is specially made for its particular job.

The Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit 7. *Sales Offices:* Chicago, Philadelphia, Boston, Buffalo, Cleveland, Newark, Pittsburgh, Houston, St. Louis, Cincinnati.

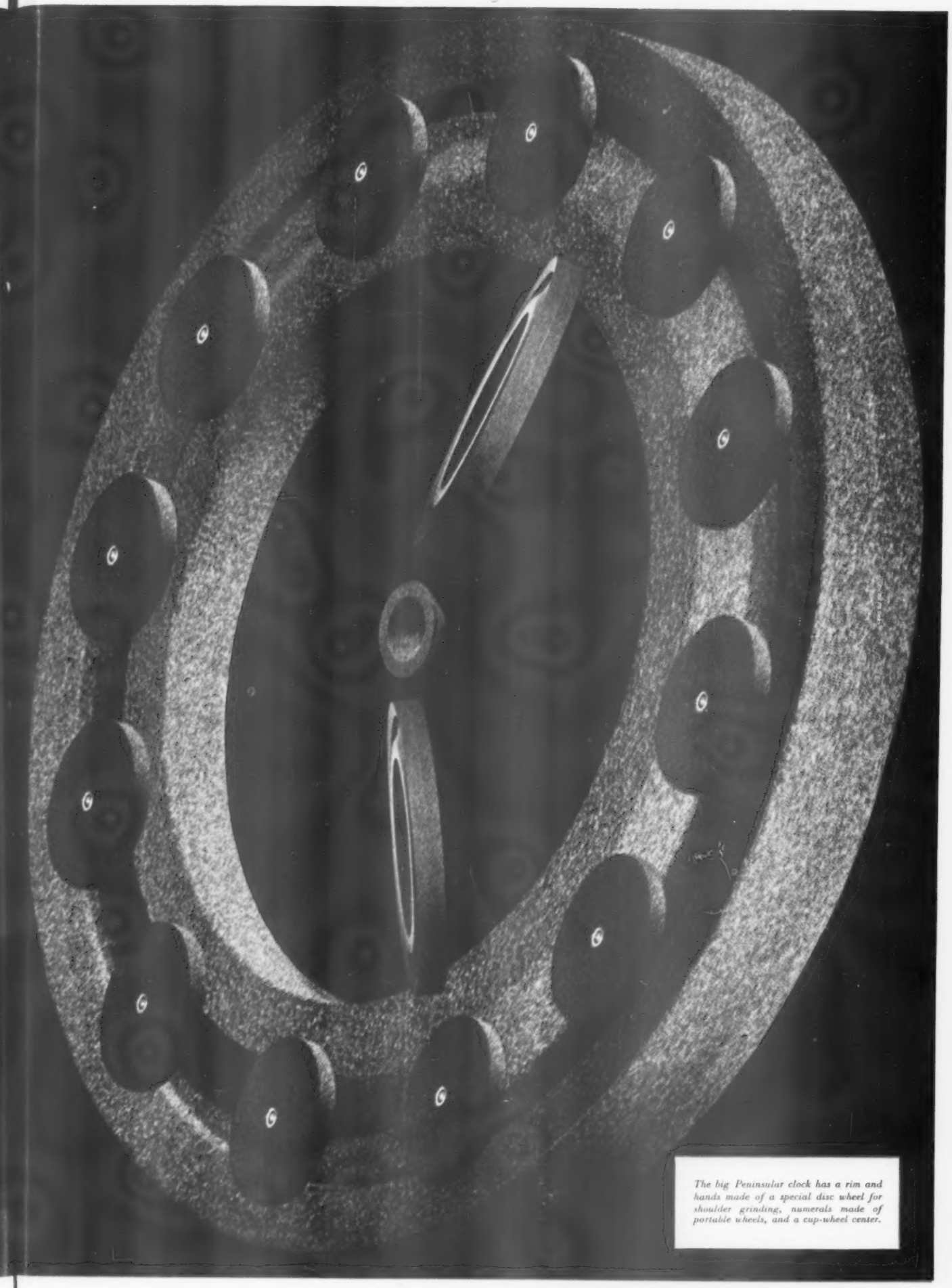
PENINSULAR

INDIVIDUALLY PENINSULAR *ENGINEERED*

GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS



The big Peninsular clock has a rim and hands made of a special disc wheel for shoulder grinding, numerals made of portable wheels, and a cup-wheel center.

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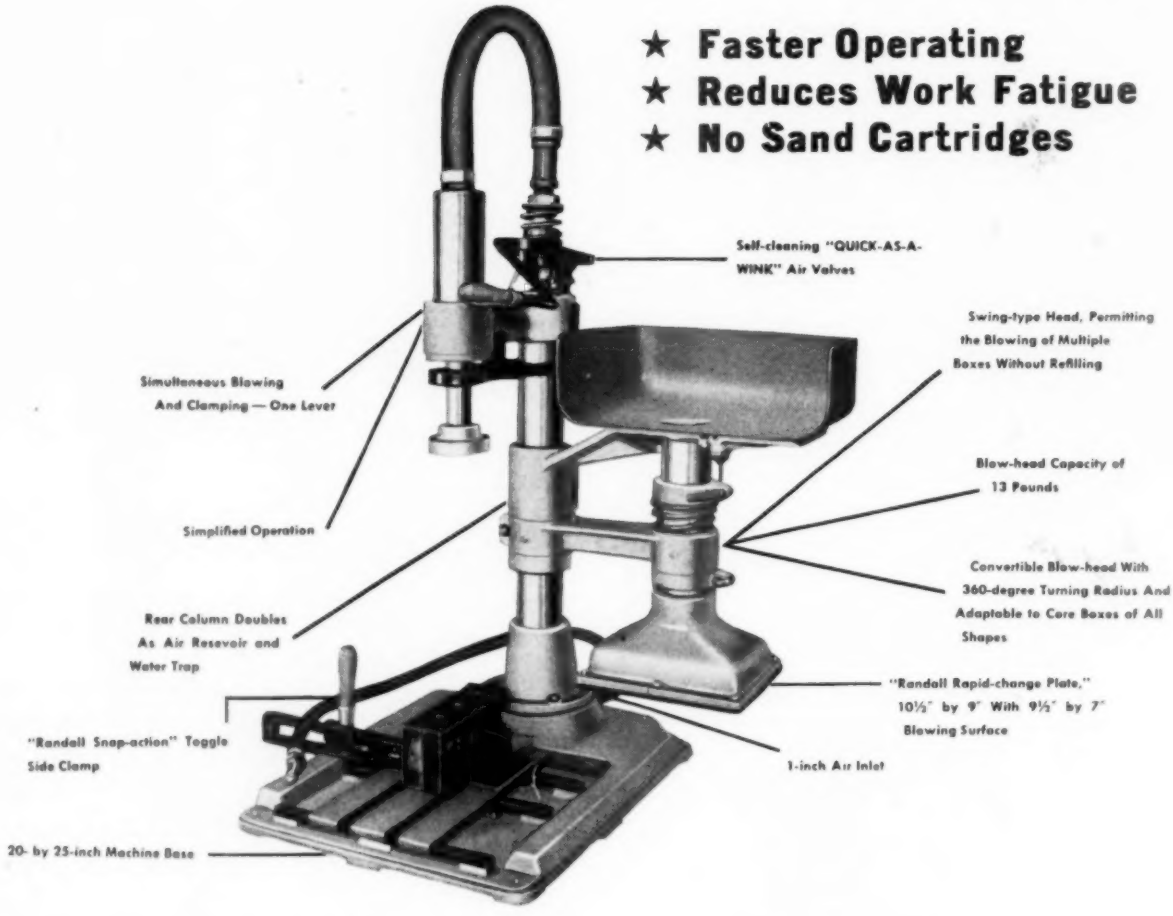
NEW RANDALL CORE BLOWER

BENCH TYPE with 360° SWINGING HEAD

★ Faster Operating
★ Reduces Work Fatigue
★ No Sand Cartridges


Self-cleaning "QUICK-AS-A-WINK" Air Valves
Swing-type Head, Permitting the Blowing of Multiple Boxes Without Refilling
Simultaneous Blowing And Clamping — One Lever
Blow-head Capacity of 13 Pounds
Simplified Operation
Convertible Blow-head With 360-degree Turning Radius And Adaptable to Core Boxes of All Shapes
Rear Column Doubles As Air Reservoir and Water Trap
"Randall Rapid-change Plate," 10½" by 9" With 9½" by 7" Blowing Surface
"Randall Snap-action" Toggle Side Clamp
1-inch Air Inlet
20- by 25-inch Machine Base

Visualized first by foundrymen actually faced with every day core-making problems, the RANDALL CORE BLOWER was made a realization only through the painstaking efforts of competent engineers, themselves versed in the knowledge of, and experienced in, the metal trades. It is due mainly to these two factors that the RANDALL CORE BLOWER has emerged as the fast, practical and dependable piece of foundry equipment it is.

The RANDALL CORE BLOWER is "designed to produce"—to produce cores fast and of a quality not to be challenged by any known core-making methods. Actual tests, conducted in working foundries, in which it was required to accept and fulfill tasks calling for the most exacting core specifications, have proven the RANDALL CORE BLOWER able and reliable and have won for it the enthusiastic approval and the high regard of foundrymen.

To the foundry manager and the core-room foreman the RANDALL CORE BLOWER promises lengthy and dutiful service and real relief from problems attending old, inefficient and expensive core-making methods . . . To the foundry owner the RANDALL CORE BLOWER promises to cut effectively the costs of core-room operation and assures him of constant, satisfied customers.

WRITE FOR FREE COPY OF DESCRIPTIVE LITERATURE

Randall
"DESIGNED TO PRODUCE"

AS SHOWN, COMPLETE WITH CLAMPING DEVICE . . . $430

THE RANDALL CORPORATION, ELKHART, INDIANA

SAVE CORE OIL!

ROYAL BINDER

Nine Reasons Why You Should Use It:

1. **INCREASES OVEN CAPACITY**—Royal bakes quickly—saves oven time.

★ 2. **SAVES OIL**—Replaces part of your oil—cuts costs.

3. **REDUCES SMOKE**—The more Royal, the less smoke.

4. **SAVES NAILS**—In facing sands it often eliminates them.

5. **WORKS SMOOTHLY**—Your coremakers will like this feature.

6. **SAVES CEREAL BINDERS**—Up to 50% —without sacrificing green strength. ★

7. **HAS GOOD PASTING STRENGTH**—Pastes joints as strong as the core itself.

8. **IS AN EXCELLENT FACING ADMIX**—Reduces cutting and scabbing—peels easily.

9. **ENJOYS INCREASING USER DEMAND**—Constantly increasing repeat orders.

★ **Does your core oil and cereal binder cost twice what they did before? You can *save* on those high-priced materials by using Royal Binder. Working samples gladly furnished.** ★

THE FEDERAL FOUNDRY SUPPLY COMPANY

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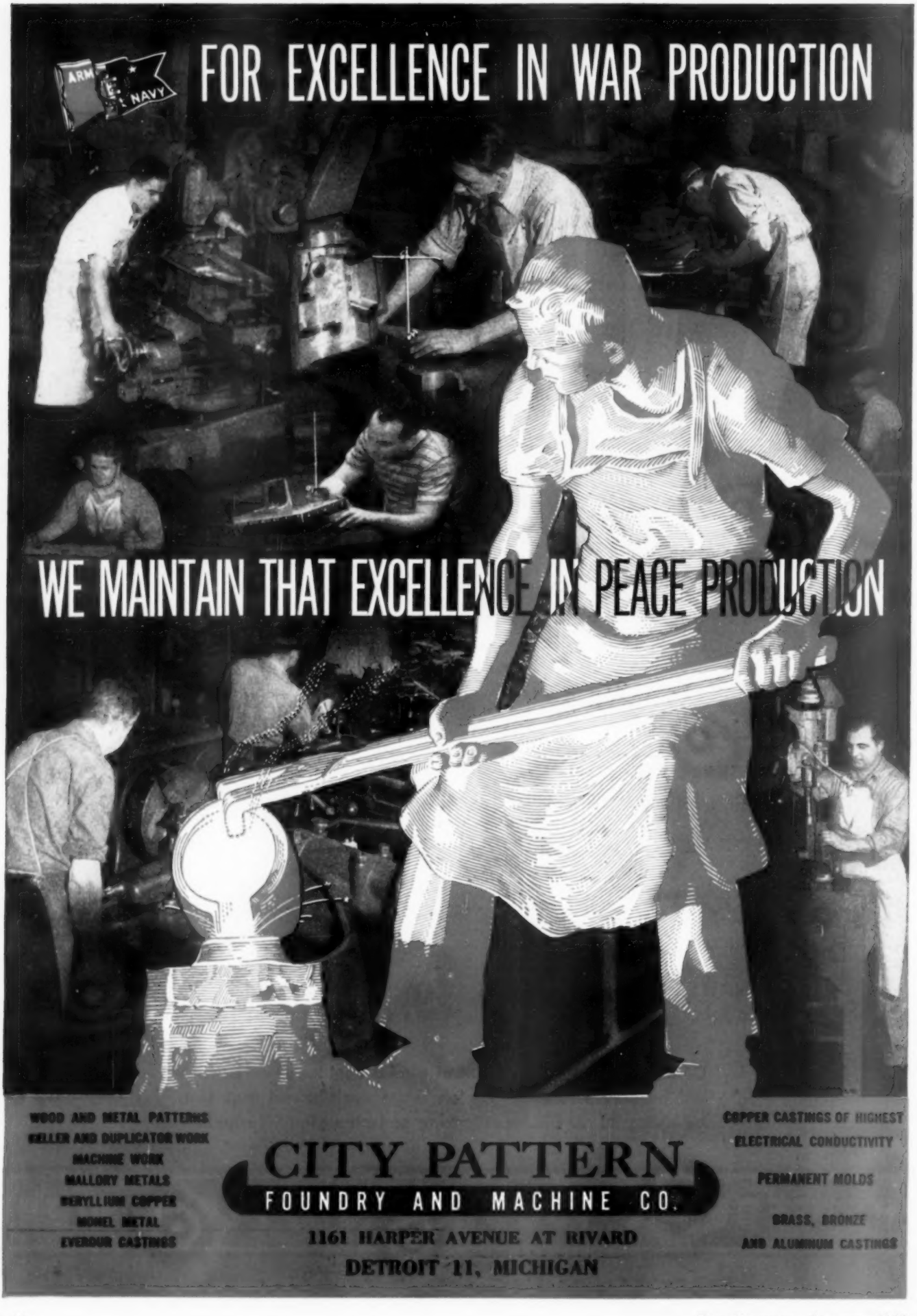
IN TWIN CITIES: The Foundry Supply Co., Inc., 2295 University Ave., St. Paul 4, Minn. IN SOUTHWEST: Beaumont Cement Sales Co., Houston & Beaumont, Texas, and Harvey, La.


FOR EXCELLENCE IN WAR PRODUCTION
WE MAINTAIN THAT EXCELLENCE IN PEACE PRODUCTION
WOOD AND METAL PATTERNS
KELLER AND DUPLICATOR WORK
MACHINE WORK
MALLORY METALS
BERYLLIUM COPPER
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1161 HARPER AVENUE AT RIVARD
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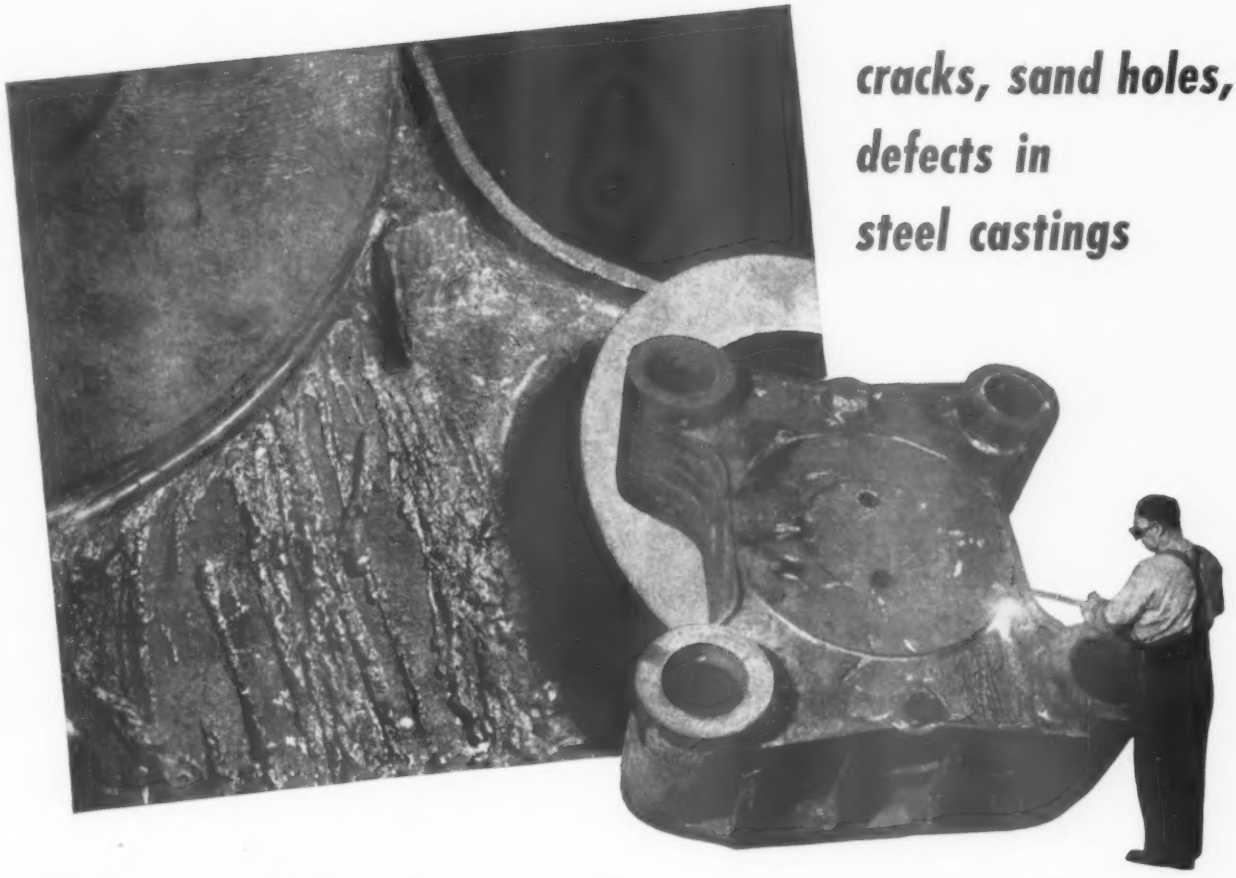
COPPER CASTINGS OF HIGHEST
ELECTRICAL CONDUCTIVITY
PERMANENT MOLDS
BRASS, BRONZE
AND ALUMINUM CASTINGS

Flame Gouging...



cracks, sand holes, defects in steel castings

16 to 24 times faster than chipping

Here is why modern Airco-developed flame gouging is rapidly replacing the slow, costly practice of chipping out shrinkage cracks, sand holes and other defects in steel castings. The figures are from actual production records of one of the largest producers of steel castings.

Size of Cavity			Chipping	Gouging
Length	Width	Depth	Time	Time
4″	2″	1″	9 minutes	½ minute
21″	4″	3″	0½ hours	20 minutes
16″	2″	2″	4 hours	10 minutes
27″	4″	4″	13 hours	35 minutes
12″	9″	3″	20 hours	1 hour
18″	10″	3″	35 hours	2 hours

—And there are additional savings because, welders say, the smooth, gouged finish enables them to do a better welding job faster.

Flame gouging is one of the modern time- and cost-saving Airco processes for steel foundries described in the booklet "New and Improved Oxyacetylene Methods for Steel Foundries". It should be a "must" on every forward-looking foundry man's reading list.

If you don't have one, ask your nearest Airco office for a free copy, or mail the coupon. Air Reduction, 60 E. 42nd Street, New York 17, N. Y. In Texas: Magnolia Airco Gas Products Co., General Offices: Houston 1, Tex. Represented Internationally by Airco Export Corporation, 33 W. 42nd Street, New York 18, N. Y.

F

AIR REDUCTION
60 East 42nd St.,
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Please send copy of your free booklet, "New and Improved Oxyacetylene Methods for Steel Foundries"

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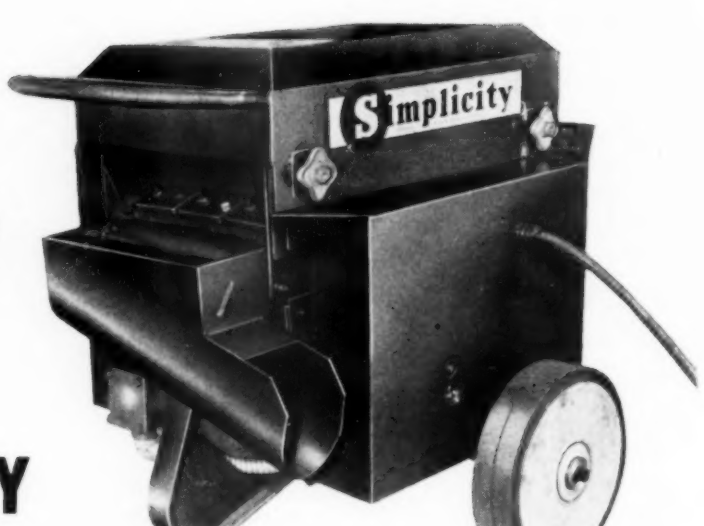
AIRCO **AIR REDUCTION**

OFFICES IN ALL PRINCIPAL CITIES

ORIGINATORS OF MODERN OXYACETYLENE AND ELECTRIC ARC METHODS FOR STEEL FOUNDRIES

GOOD NEWS

FOR THE SMALL FOUNDRY



NEW SIMPLICITY 12"x18" PORTABLE SAND SCREENING AND CONDITIONING UNIT FOR THE SMALL FOUNDRY

Here's the ideal sand screening and conditioning unit for the small foundry where production does not warrant installation of large-capacity and relatively expensive sand handling equipment. The Simplicity 12″ x 18″ Portable Sand Conditioner screens, aerates, and fluffs 7 tons of sand per hour with all the efficiency and dependability of the larger Simplicity models. It is easy to move, weighing only 415 lbs., and its overall dimensions of 28″ x 28″ x 29″ demand a minimum of working and storage space. You can depend on sand conditioned in the Simplicity 12″ x 18″ Portable to help assure production of the high quality castings which foundry operators the country over are producing with Simplicity equipment.

FOR THE LARGER FOUNDRY

Simplicity Portable and Semi-Portable Sand Screening and Conditioning Units are made in four other sizes: 2′ x 3′ — 3′ x 6′ — 4′ x 4′ and 4′ x 8′.

Send us your production requirements and we will be glad to recommend the specific model for your foundry.

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY
DURAND, MICHIGAN

SAVE
EXTRA HANDLING!

USE CMD *DUAL-PURPOSE CORE TRAYS*

The CMD Dual-Purpose Core Tray can be used for baking the cores, thus eliminating transfer of cores from core plate to core tray.

Because of their lock-stacking features, these trays make possible storage from the floor up. Bins and racks are no longer necessary.

SPECIFICATIONS

SIZE—12" X 24"

LOADING HEIGHT—4½"—6" OR 7"

OVERALL HEIGHT—5½"—7" OR 8"

WEIGHT—9½ POUNDS

MATERIAL—16 GA. SHEET METAL

SPOT WELDED (28 POINTS)

ALL ROUNDED CORNERS

2 BOTTOM REINFORCEMENT ANGLES

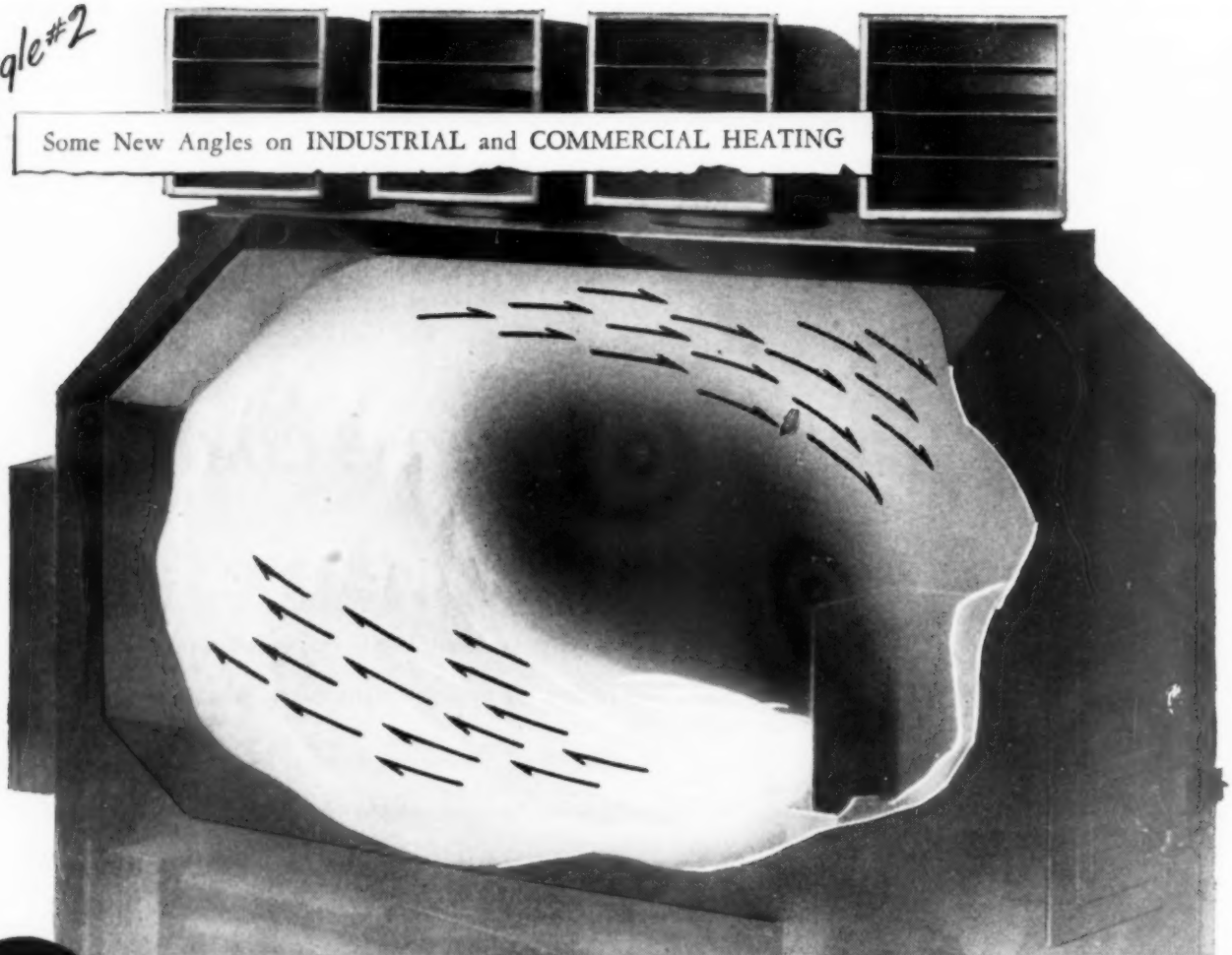
CONSTRUCTED FOR STACKING

CHICAGO MANUFACTURING & DISTRIBUTING CO.

Dept. 5F, 1928 West 46th St. CMD Chicago 9, Illinois

Angle #2

Some New Angles on INDUSTRIAL and COMMERCIAL HEATING



THIS IS COUNTERFLO COMBUSTION

The patented Dravo method of burning gas or oil with maximum efficiency by lengthening flame travel within the combustion chamber of an air heater, thereby allowing time and space for complete combustion is COUNTERFLO COMBUSTION. In this method the products of combustion are in active and intimate contact with the entire surface of a stainless steel combustion chamber, thus insuring uniform heat transfer at all points.

● **DRAVO COUNTERFLO DIRECT FIRED HEATERS offer many advantages for heating of open-spaces in commercial and industrial buildings. Economies resulting from COUNTERFLO COMBUSTION include:**

- **Complete fuel combustion with elimination of CO**
- **Freedom from fuel residue on combustion surfaces**
- **Sustained efficiency of heater at 80-85%**

All the angles of industrial and commercial heating with DRAVO COUNTERFLO DIRECT FIRED HEATERS are described in Bulletin 516. Write Heating Section, Dravo Corporation, 300 Penn Avenue, Pittsburgh 22, Pennsylvania.

DRAVO CORPORATION

PITTSBURGH • WILMINGTON • PHILADELPHIA • WASHINGTON • NEW YORK • CLEVELAND • DETROIT

Out of our Mail Bag...

comes the proof of the SUPERIORITY of the ——

CLEARFIELD MIXER

"This machine has worked out splendidly."

"We have nothing but praise for this mixer."

"We are obtaining the best of results from this mixer."

"Doing a very satisfactory job. Perfect in every respect."

"Your sand mixer is satisfactory in every way and is doing a very efficient job."

- Here are some comments from users of the Clearfield Mixer. The complete Clearfield story is in our catalog. Write for your copy.

The four Clearfield Mixers... Nos. 404, 610, 920 and 930. Capacities range from 4 cu. ft. to 40 cu. ft. per batch.

CLEARFIELD
MACHINE COMPANY
CLEARFIELD
PENNSYLVANIA, U. S. A.

1897 *1947*

OUR **GOLDEN ANNIVERSARY** YEAR

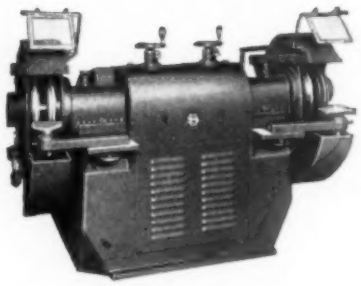
FIFTY YEARS OF PIONEERING AND PROGRESS

Check your tool inventory and bring your needs up to date

• • • •

MAKE 1947 A BETTER YEAR IN PRODUCTION OR MAINTENANCE

"YOU can't do a good job without good tools" . . . since 1897 we've been supplying the *best electrical tools for all industry* . . . and now as our fiftieth year dawns thousands of plants, large and small, testify to the soundness of that statement. So . . . make sure your electrical tools are right, up-to-date . . . ample and efficient.



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UNITED STATES ELECTRICAL TOOLS

- Portable Electric Drills
- Bench and Floor Buffers
- Bench and Floor Grinders
- Valve Seat Grinders
- Valve Refinishing Shops
- Portable Grinders
- Portable Surfacers
- Portable Polishers
- Portable Sanders
- Flexible Shaft Machines
- Portable Tappers
- Bench and Floor Polishers
- Portable Electric Saws
- Portable Electric Hole Saws and other items

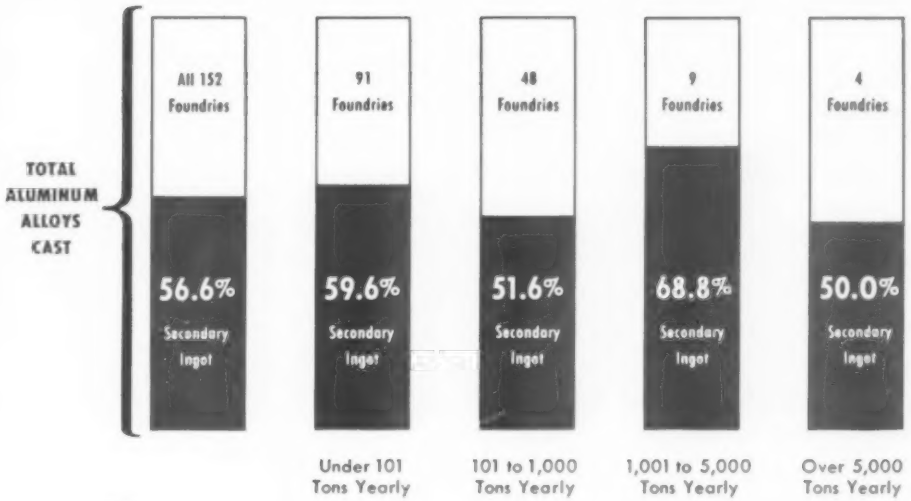
DUAL MOTOR VARI-SPEED SNAGGING GRINDER
Model 62 VS
For vitrified or high speed wheels

Constant peripheral speed for each wheel results in increased production and longer wheel life. Wheel guards are adjustable to wheel wear; interlocked with speed changer, to prevent overspeeding of grinding wheels. Totally enclosed fan-cooled, ball bearing motors.

The UNITED STATES ELECTRICAL TOOL Co.
CINCINNATI, OHIO

Preferred

FOR CASTING



Foundries, from smallest to largest, use Secondary Ingot for the greatest tonnage of Aluminum Alloy Castings, as shown in this chart:*
To learn the reasons for this preference, consult any member.

* From a survey of 152 Foundries which produced in 1946 approximately fifty per cent of all aluminum castings.

Samuel Greenfield Co., Inc.
Buffalo 12, New York

William F. Jobbins, Inc.
Aurora, Illinois

R. Lavin & Sons, Inc.
Chicago 23, Illinois

The National Smelting Co.
Cleveland 5, Ohio

Niagara Falls Smelting & Refining Corp.
Buffalo 17, New York

North American Smelting Co.
Philadelphia 34, Pa.

Sonken-Galamba Corporation
Kansas City 18, Kansas

U. S. Reduction Co.
East Chicago, Indiana

Aluminum and Magnesium, Inc.
Sandusky, Ohio

The American Metal Co., Ltd.
New York City 6

Apex Smelting Co.
Chicago 12, Illinois

Berg Metals Corporation
Los Angeles 11, California

The Cleveland Electro Metals Co.
Cleveland 13, Ohio

Federated Metals Division A. S. & R. Co.
New York City 5 and Branches

General Smelting Company
Philadelphia 34, Pennsylvania

MEMBER · ALUMINUM RESEARCH INSTITUTE ·

ALUMINUM RESEARCH INSTITUTE

111 West Washington Street • Chicago 2, Illinois

HINES PINS A

WILL NOT RUST OR STICK

NO LUBRICANT REQUIRED

ROUND

HEXAGON

HARDENED...GROUND AND CHROME PLATED

THE HINES F

3431 WEST 140th ST.

S AND BUSHINGS

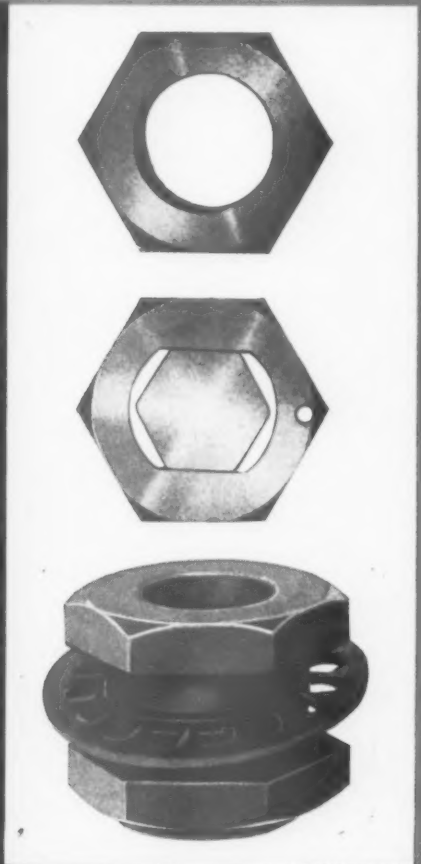
FOR ALL PATTERN PLATES AND FLASKS

Supply your pattern department with Hines Pins and Bushings and you automatically eliminate a great source of their troubles.

THE PINS—Round or Hexagon, hardened, ground and chrome plated. Extremely accurate, will not stick or rust. Made in various sizes with long or short shanks.

THE BUSHINGS—Round or oblong, held in place by simple lock washer and jam nut. Easy to install or replace. Note broad wearing surface of these hardened bushings in illustration at right. Made in two lengths—short for flasks and pattern plates up to ½" thick, and long for pattern plates ½" to 1" thick.

Write for Complete Details and Prices



TOOLS FOR INSTALLATION

This counterboring tool and wrenches are the only tools needed for any installation of Hines Pins and Bushings.

S FLASK CO.

CLEVELAND 11, OHIO

SAVE UP TO 50% OF YOUR CORE COSTS WITH LESS MEN

Equip Your Core Room With a
NEWAYGO "RAPPLESS" CORE DRAWING MACHINE

This low cost unit will draw any size or shape core box that can be lifted by hand. It is flexible so you can draw angle boxes as well as straight boxes and also draws boxes used with core blowers equally as well.

A recent installation in an eastern foundry core room

SIX MAJOR FEATURES:

1. Low in first cost, operating cost and maintenance cost.
2. Minimum floor space.
3. Quick adjustment for angle boxes.
4. Can be used for two man operation.
5. No special pins or grooved plates needed on your core boxes.
6. Cores move through the machine continuously eliminating setting off of plates at side or reaching over work.

TRY IT BEFORE YOU BUY IT WRITE US TODAY FOR 10 DAY FREE TRIAL OFFER AND DESCRIPTIVE LITERATURE

NEWAYGO ENGINEERING COMPANY

Newaygo, Michigan

Manufacturers of Newaygo Sand Handling, Cooling and Conditioning Equipment

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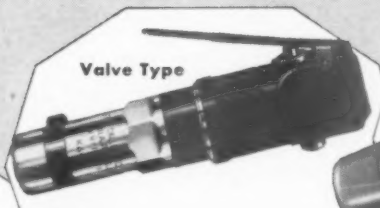
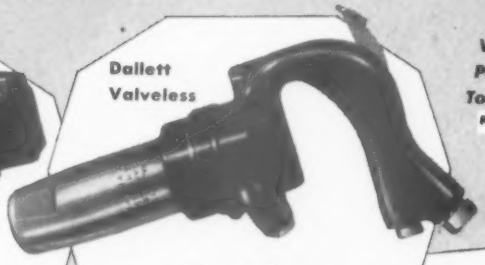
The **DALLETT LINE** *of Pneumatic Tools and Accessories*

Precision Built



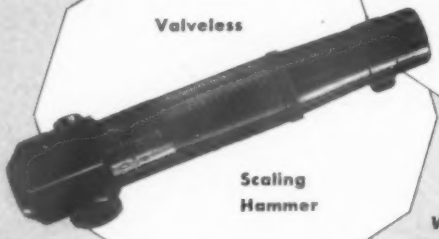
Valve Type



Dallett Valveless

Chipping Hammer

Write for Pneumatic Tool Bulletin No. F100



Valveless

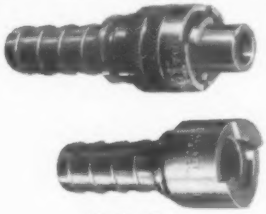
Safety Retainer Chipping Hammer

Scaling Hammer

Write for Pneumatic Chisel Bulletin No. F200

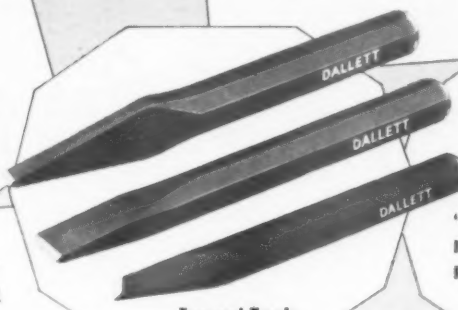
Dallett Pneumatic Tools are made in a number of sizes and designs for many specific uses . . . valve and valveless type, with button, lever or handle control:

Interchangeable

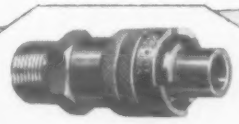


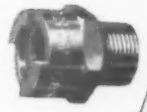
"Dalbo" Hose Ends

Dallett's—"Dalbo"—Air Hose Fittings and Couplings are machined from solid bar stock—are leakproof—with safety locking sleeve.



Forged Tools



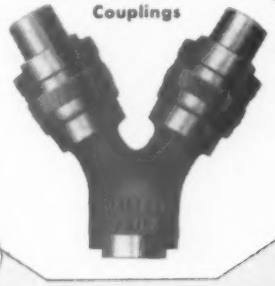


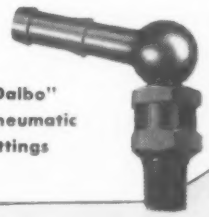
"Dalbo" Interchangeable Pipe Ends

Dallett chisels and blanks are made in most standard shanks—safety retainer chisels are available for most makes of small pneumatic tools.

Write for Forged Tool Bulletin No. F210

"Dalbo" Couplings





"Dalbo" Pneumatic Fittings

Write for "Dalbo" Couplings and Fittings Bulletin No. F300

Safety Retainer Chisels

TOOL MAKERS

PNEUMATIC DALLETT EQUIPMENT ACCESSORIES

SINCE 1883

THE DALLETT COMPANY

MASCHER AT LIPPINCOTT STREET, PHILADELPHIA 33, PA.

Manufacturers of Pneumatic Tools and Accessories

DISTRIBUTORS in principal cities throughout the United States, Canada, Europe and South America.

MOLDED TO *Perfection*

LOVELY VIRGINIA MAYO

"Virginia Mayo, soon to be seen in Samuel Goldwyn's "The Best Years of Our Lives," an outstanding new drama to be released by RKO Radio Pictures."

Try this

NEW WARTIME DEVELOPMENT IN

L-O

LIQUID PARTING

Send for a free sample today

Here is a new improved liquid parting second to none! A war-time development perfected in our research laboratories and thoroughly tested in foundry operations . . . a distinctive product which cleans and seals with a maximum of effectiveness. Smith L-O Liquid Parting embodies fast acting, powerful solvents, a special graphite, and high melting point waxes which cleanse and prepare pattern surfaces permitting many draws between applications.

It is especially efficient for patterns on sand slinger operations, and in many instances, foundrymen use the deposit of graphite as a facing to give a stove plate finish to castings. You are sure to get the utmost satisfaction from this time-saving, work-saving parting because it can appreciably reduce costs and increase production. Once you have tried it, you will agree it is all we claim it to be. Free samples of this economical solution are ready for shipment to you. Send for yours today!

WAREHOUSE STOCKS OF SMITH L-O CORE OIL, CORE WASH, ROD DIP, LIQUID PARTING AT

FOUNDRY SERVICE CO.
Birmingham, Alabama

E. R. FROST CO.
Minneapolis, Minnesota

INDIANA PRODUCTS CO., INC.
Kokomo, Indiana

FRANK C. MALEY
Detroit, Michigan

WILLIAM F. ROSE
Tomkins Tidewater Ter., South Kearny, N. J.

SOUTHWEST FOUNDRY SUPPLY CO.
Houston 7, Texas

MALCOLM G. STEVENS
Arlington, Massachusetts

M. W. WARREN COKE CO.
St. Louis, Missouri

WESTERN FOUNDRY SAND CO.
Seattle, Washington

WESTERN INDUSTRIAL SUPPLY CO.
Portland 14, Oregon

Smith L-O *Liquid Parting*

CORE OIL CORE WASH ROD DIP

SMITH OIL & REFINING CO.

INDUSTRIAL OILS DIVISION . . . ROCKFORD, ILLINOIS

IN A CLASS BY ITSELF

The purpose of this message is to bring you up to date on the many important "extras" which you receive when dealing with Tonawanda Iron Corporation.

First, of course, is the extra quality of the iron itself. Tonawanda G-Iron, for example, is produced by a special patented blast furnace process which refines the grain structure of the pig—and this refinement *follows through* to the final casting. The finely distributed graphite increases fluidity and reduces chill in thin sections—improves machinability and helps to overcome internal shrinkage and porosity between thin and heavy sections.

Secondly, each car of Tonawanda Iron contains a durable sign, showing the car number and silicon content for quick identification upon arrival and when unloaded...an added service to make your job a little easier.

Thirdly is the Silicon-Carbon Chart for G-Iron—yours for the asking—especially designed to help you make sound castings using G-Iron.

Foundrymen everywhere agree that it is these and other helpful "extras" which put Tonawanda Iron Corporation—in a class by itself!

TONAWANDA
for sound castings

TONAWANDA IRON CORPORATION

NORTH TONAWANDA, N. Y.

Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

TEAM WORK

ON THE GRIDIRON

is essential to a high-scoring Eleven. Outstanding individuals emerge as stars only when there is precision timing by the complete team.

TEAM WORK... IN YOUR FOUNDRY

is essential to a high-scoring production record. To obtain a maximum of scoring power, more and more foundries are installing the outstanding mold-producing Davenport team.

Davenport Jolt Rollover Draw, producing drags, timed with Davenport Jolt Stripper Pin Lift, producing copes, give you the ultimate in team work. *Write today for detailed information.*

Davenport Jolt Rollover Draw Model A

Davenport Jolt Pin Lift Model AJS (portable)

DAVENPORT MACHINE AND Foundry Company

DAVENPORT IOWA U. S. A.

CANADIAN REPRESENTATIVES: CANADIAN FOUNDRY SUPPLIES & EQUIPMENT, LTD., TORONTO AND MONTREAL

TOP HEATING EFFICIENCY FOR PERMANENT MOLD CASTING

Courtesy of Eastern Casting Corp., Newburgh, N. Y.

Fisher QUICK HEATING HOLDING FURNACES

Economical and uniform *permanent mold castings* account for nearly ⅓ of all aluminum castings made, although only about 7% of aluminum foundries use this process. Obviously, then, permanent mold casting calls for high production per man, per machine and *per furnace*. This essential *service efficiency* is assured to you with *FISHER Holding Furnaces* . . . especially designed for quicker heating and more accurate temperature control. Maximum productivity is obtained by hot charging from large Fisher Tilting Furnaces. Write for complete details and catalog.

Holding Furnaces

Melt-down Furnaces

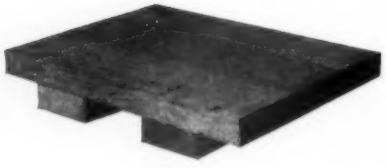
5519 N. WOLCOTT AVE., CHICAGO 40, ILLINOIS

Fisher FURNACE COMPANY

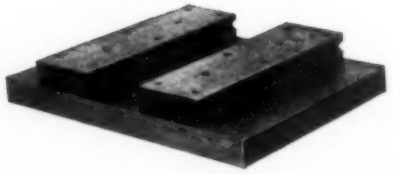
Engineers and Manufacturers

Everything you need

PEAK PRODUC



Cherry Snap Flasks
Cherry Slip Flasks
Aluminum Slip Flasks
Easy-Off Flasks
Cherry Presser Boards
Wood Bottom Boards
Steel Bottom Plates



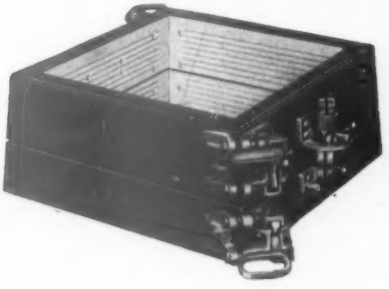
For the
highest quality
in foundry equipment
specify "Adams"

THE ADAMS COMPAN

MOLDING MACHINES · FLASK E

ed for

UCTION!

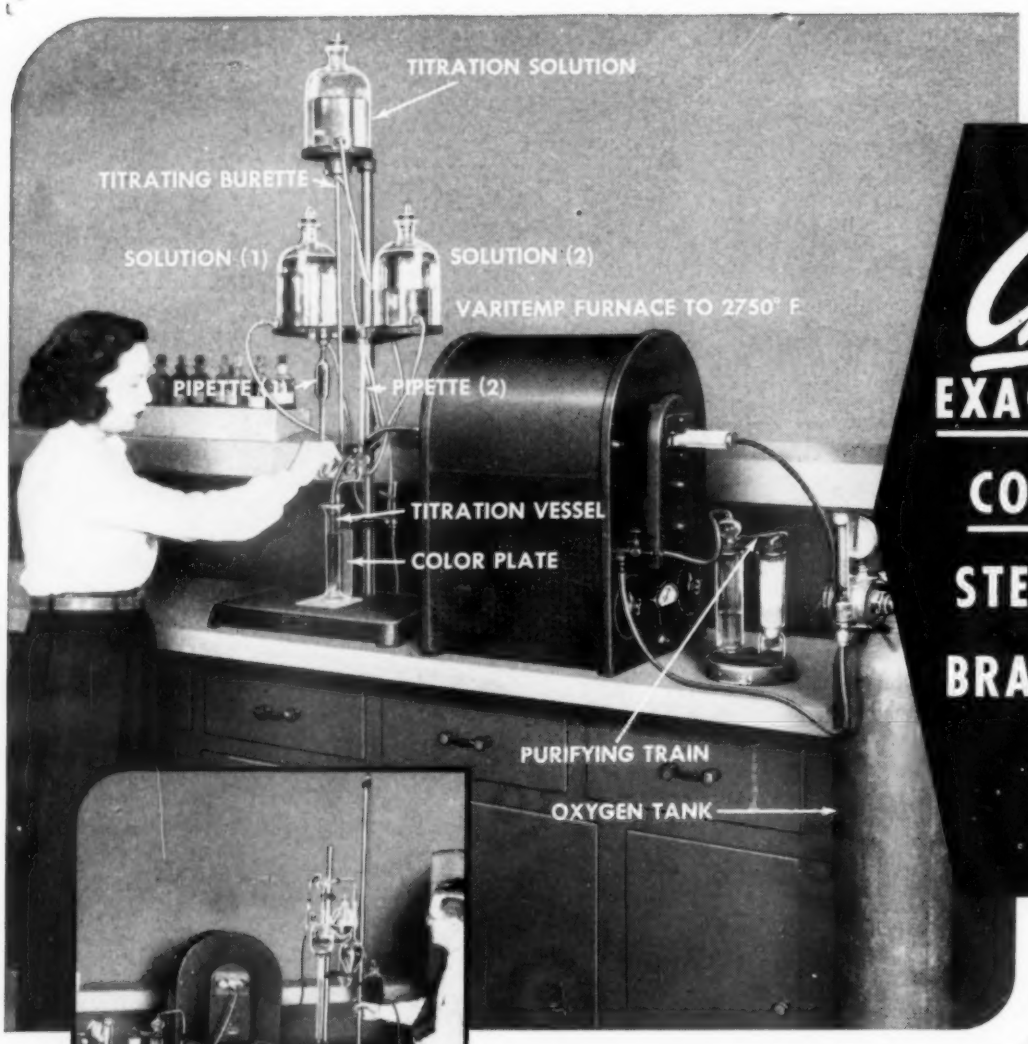


Steel Jackets
Aluminum Jackets
Cast Iron Jackets
Steel Bands
Steel Upsets
Cherry Upsets
Aluminum Upsets
Molding Machines
Vibrators
Knee Valves
Table Rappers
Tubular Sprue Cutters

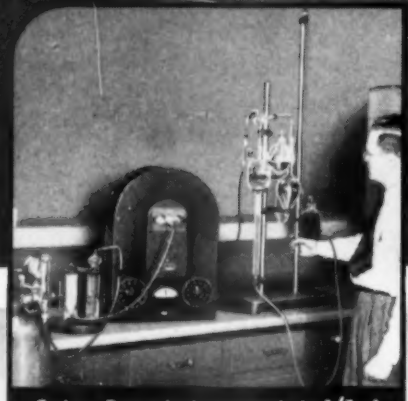
Descriptive literature on any of these items gladly furnished!

PANY · DUBUQUE, IOWA · U.S.A.

SK EQUIPMENT Established 1883



Check EXACT SULFUR CONTENT of STEEL, IRON, BRASS, COAL, COKE



Carbon Determinator accurate to 1/5 of one point. Test period 2 minutes.

Moisture teller gives exact moisture content of sample in 1 minute and requires no skill in handling.

The Dietert Detroit Sulfur Determinator provides accuracy equivalent to gravimetric determination but very much faster (in just 2 minutes) and easier. It is equally applicable to either alkaline or iodate methods, meets procedure standards as recommended to the ASTM, and you can buy it for less money than any other comparable apparatus. Just check this up for your own information.

With this sturdy compact unit you have just one titration solution that must be carefully prepared and it contains only one chemical.

Note the large solution bottles and the titration vessel which is easy to clean and economical to replace if accidently broken.

ASK FOR INFORMATION ON OTHER DIETERT DETROIT TEST EQUIPMENT

Harry W. Dietert Company

DIETERT EQUIPMENT

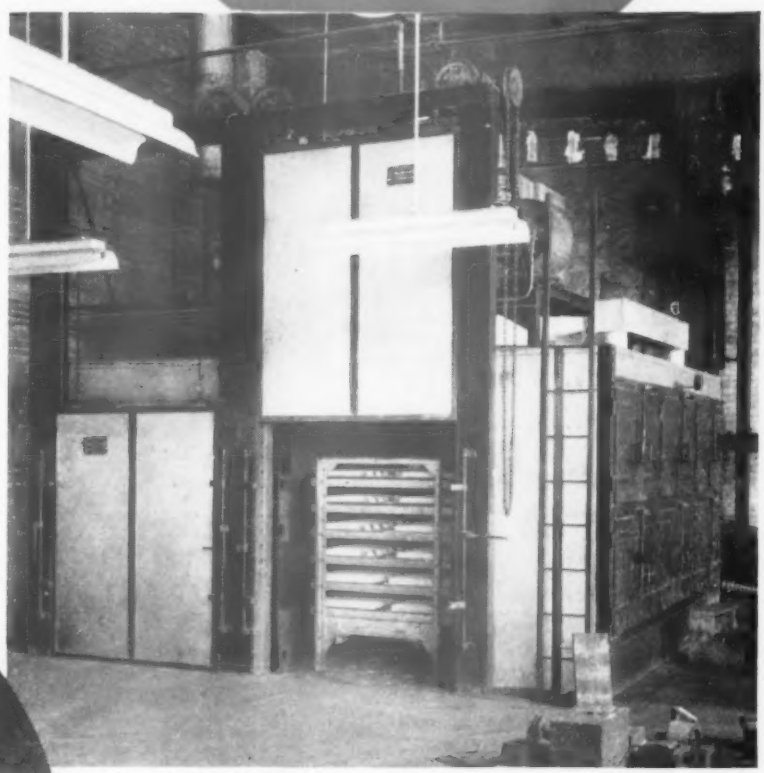
9324 ROSELAWN AVE. • DETROIT 4, MICHIGAN

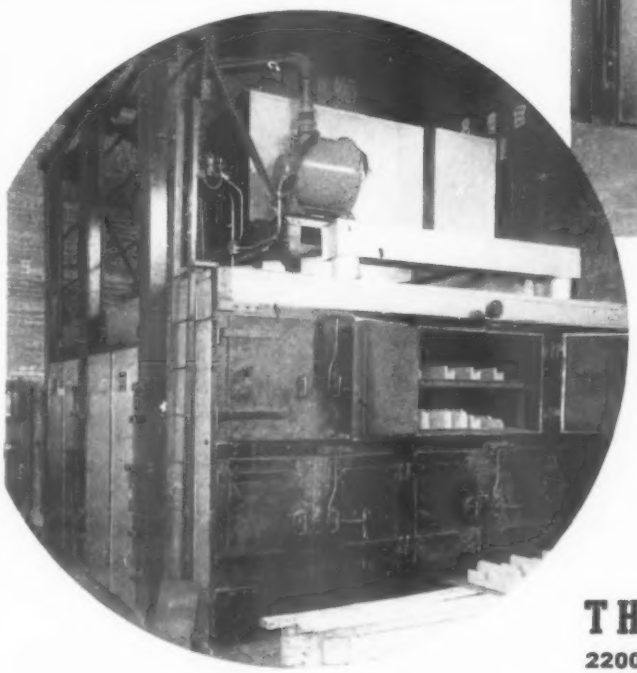
Modernize with MAEHLER

. . . for higher production and better baked cores—modernize your core baking facilities with Maehler-engineered equipment.

You can turn out better cores, faster and at less cost with Maehler-engineered ovens. One reason for this is the recirculating air heat principle which is incorporated in Maehler ovens. This principle, pioneered and perfected by Maehler, assures perfect heat uniformity, shortens baking time, gives you more perfectly baked cores and eliminates green or burned cores.

Maehler core and mold ovens are available in a complete range of oil-fired, gas-fired and electrically heated units. Plan now to modernize your core-baking facilities. Call a Maehler engineer today or write for latest bulletins.





The photos reproduced here, taken at the American Brake Shoe and Foundry Co., show a Maehler oil-fired, four-rack, double compartment lift door oven which was installed to replace obsolete coke-fired ovens. The view at the left shows the six double door side compartments in this oven for small cores. With this modern Maehler installation the user reported more uniformly baked cores, one bake every 2½ hours instead of one per day, elimination of smoke in the core room and low cost efficient operation.

THE PAUL MAEHLER COMPANY
2200 WEST LAKE STREET CHICAGO 22, ILLINOIS

MAEHLER

Industrial Ovens and Furnaces for Core Baking, Mold Drying, Heat Treating, Enameling, etc.

"A NORTHERN HI-LIFT HOIST up there Would Slash Handling Costs"

An efficient Northern Hi-Lift . . . low-headroom Electric hoist saves in many ways:

1. labor saving

When men lift and move material by hand, the power generated costs you at least $5 per kilowatt hour. Power for a Hi-Lift Electric Hoist costs you less than a nickel per kilowatt hour. Manpower lifting is slow, time wasting, costly. Hi-Lift Hoists do it quickly, economically.

2. time and overhead saving

Inefficient, slow material handling causes delay and countless minutes of lost time all through the shop while other operations wait on handling. Hi-Lift Hoist saves this time and money.

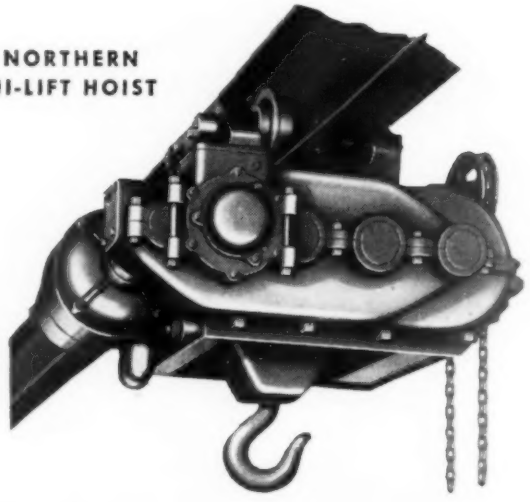
3. saving through safety

Men handling heavy material by hand are subject to serious and costly injuries. Power handling avoids these.

4. saving in floor space and overhead

Northern Hi-Lift Hoists use *no* floor space—carry the material above the floor. There is no vehicle wear on the floor—no danger to workers from rapidly moving vehicles. Aisles are used for work and walk space only—a substantial saving in space. The low-head-room feature of Hi-Lift Hoists makes better use of overhead space—permits handling of bulkier loads.

NORTHERN HI-LIFT HOIST



Northern Hi-Lift Electric Hoists are extremely sturdy, long lasting. Write for Bulletin H-1.

1542

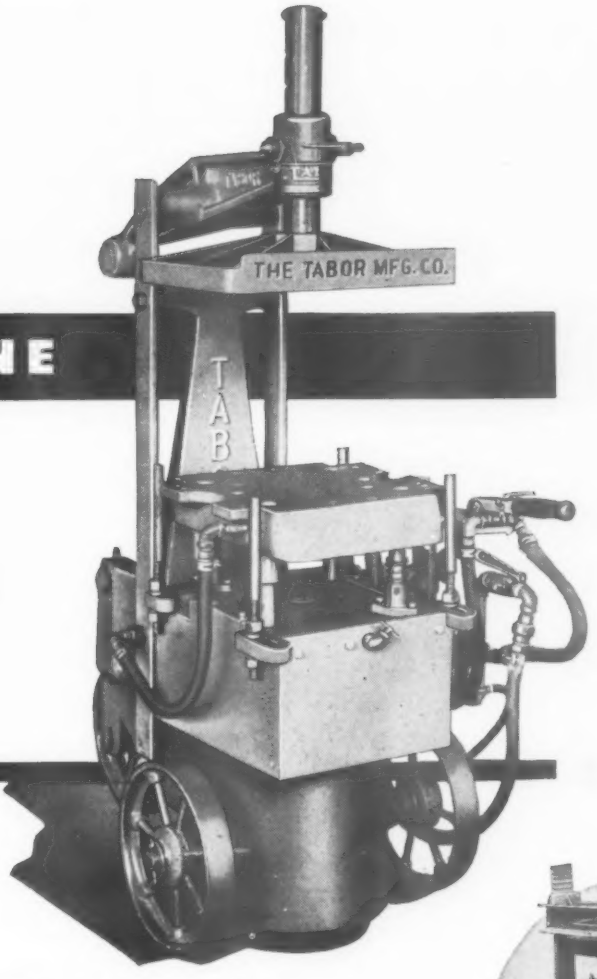
NORTHERN ENGINEERING WORKS
General Offices: 2625 ATWATER ST.
DETROIT 7, MICH.

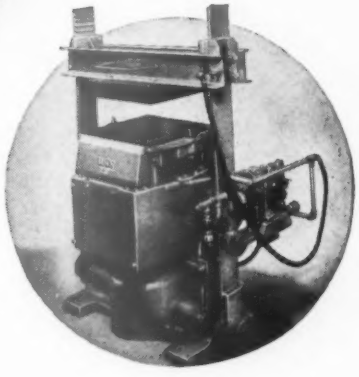
TYPES OF NORTHERN HI-LIFT HOISTS AVAILABLE

Floor controlled hoists • *Motor traveled hoists*
Cab controlled hoists • *Base mounted hoists*

USE THIS ONE

WHERE (and *when*) you need it





It's a smaller, portable version of your Tabor Yoke-type, Jar-squeeze, Flask-lift Machine

This portable is built to handle a variety of jobs, with unusual efficiency. You can move it to any part of the foundry floor—as needed. Let's look at its features.

FOR FLEXIBILITY:

- Being portable, you can move the machine to the work.
- Adjustable flask-lifting pins—take flasks 10"—16" wide—up to 16" long.
- Molds copes and drags. Where drags can safely be turned by hand, the Tabor machine's amazing production capacity is even further increased.

FOR EFFICIENCY:

- Jars the mold—tucking is greatly reduced, and in most cases entirely eliminated.
- Squeezes the mold—does away with butting-off time.
- Draws the pattern and lifts the flask—cleanly, smoothly. Stools and stripping plates are seldom necessary.

Included, of course, is the usual Tabor machine durability—so familiar to the industry.

Bulletin No. 451 describes all our flask-lift machines. Write for your copy—today! And, always remember to consult Tabor on any of your foundry machine needs.

REPRESENTATIVES
Snyder Foundry Supply Company, Los Angeles, California; Gallagher Foundry Supply Company, San Francisco & Oakland, California; Carl F. Miller & Company, Seattle, Washington; M. W. Warren Coke Company, 1017 Olive St., St. Louis 1, Mo.

MANUFACTURERS' ASSOCIATION INC. FOUNDRY EQUIPMENT

The TABOR *Manufacturing Co.*

SINCE 1884 MANUFACTURERS OF FOUNDRY MOLDING MACHINES
6225 TACONY STREET • PHILADELPHIA 35, PENNA.

Three Outstanding NEW NORTON DEVELOPMENTS

32 ALUNDUM ABRASIVE

THE grains of this sensational new Norton abrasive are sharper than those of any other abrasive. This means that 32 ALUNDUM wheels penetrate the work more easily—removing metal faster and with longer wheel life. This sharper cutting action is especially advantageous with portable grinders, where only limited pressures can be applied, and with certain floor stand jobs. Operators find that much less effort is required to do more work with 32 ALUNDUM grinding wheels.

for the Foundry

B-5 RESINOID BOND

INTRODUCED a little over a year ago for wheels in the soft and medium hard range, B-5 resinoid bond has been a tremendous success. Operators like the Norton B-5 wheel because it stays sharp—cutting fast and smooth. And grinding costs are down because the fast cutting action is obtained without sacrifice of wheel life. B-5 bond produces a wheel that is mechanically strong and thereby long-lasting.

B-7 RESINOID BOND

THIS newest Norton resinoid bond brings to wheels in the hard grades the same combination of fast cutting action and long life which has made B-5 so popular in the softer grades. A stronger and more heat-resistant bond, B-7 is showing remarkable cost-cutting ability on floor stands, swing frames and portable grinders.

32 ALUNDUM abrasive is available in the new B-5 and B-7 resinoid bonds and in vitrified bond. B-5 and B-7 resinoid bonds are also available with ALUNDUM, 57 ALUNDUM, and CRYSTOLON abrasives. This assortment of outstanding abrasives and bonds makes it possible to provide the most efficient wheel for every foundry grinding job. Call in your Norton abrasive engineer, or the abrasive specialist of your Norton distributor, for specific recommendations.

NORTON COMPANY • WORCESTER 6, MASSACHUSETTS

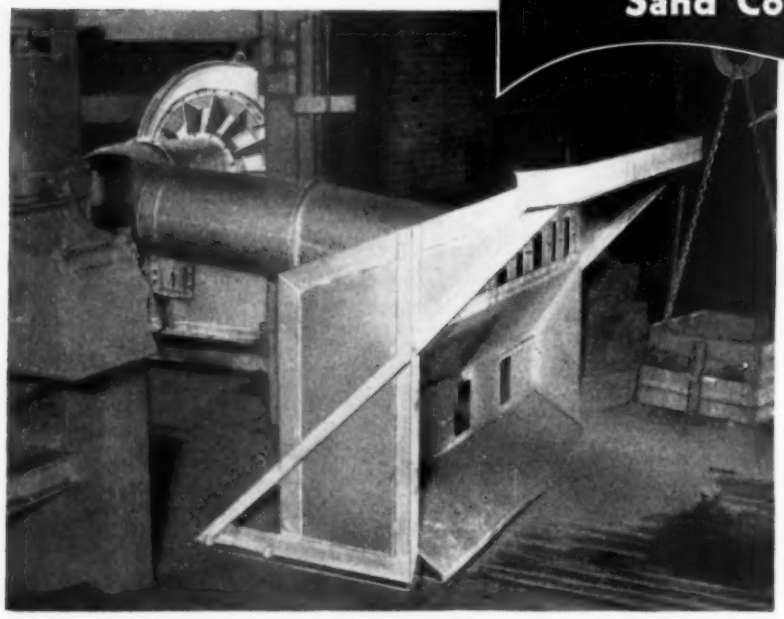
W-1092

T. M. REG. U.S. PAT. OFF.

NORTON ABRASIVES

This specially designed AAF shakeout hood served by Roto-Clone combined exhauster and dust separator is typical of many in general foundry use thruout the nation.

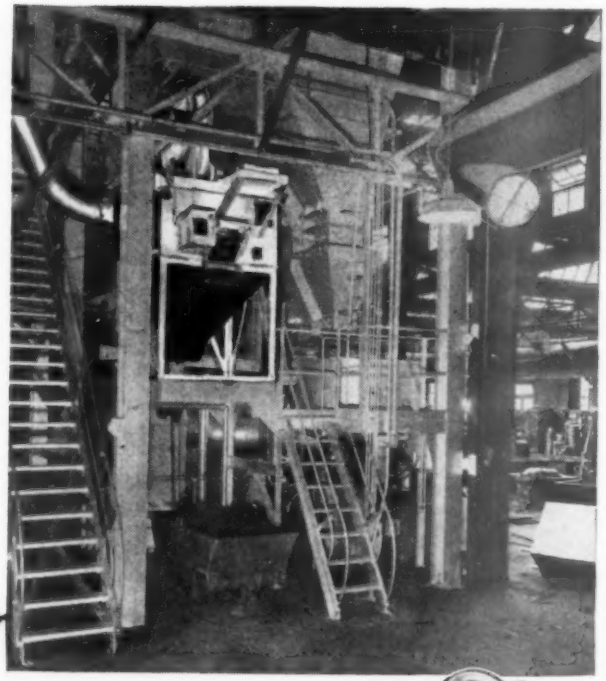
A RECENT ROTO-CLONE Shakeout Hood and Sand Conditioning Installation



AAF-engineered side hoods exhausted by Type W (wet) Roto-Clones offer the most practical method of dust control for large shakeouts served by overhead cranes. The strong indraft of the Roto-Clone diverts the dust and fumes and prevents their dispersion to the surrounding work area. Equipment does not interfere with the operation of the shake-out crane and requires a minimum of space and piping to collect, precipitate and store the dust.

Roto-Clones are available in both wet and dry types for every foundry dust control problem occasioned by screens, mullers, tumbling mills, blasts, grinders, in addition to the operations illustrated.

The Type W Roto-Clone shown here collects the fines from the sand and deposits the resulting sludge in the disposal truck below.



The type W Roto-Clone affords effective control of dust from sand conditioning equipment and at the same time insures uniform permeability of the molding sand by exhausting the required amount of fines.

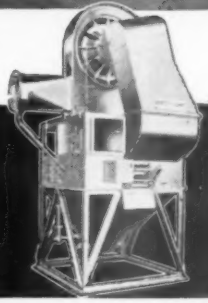
The advantages of compact design and the adaptability of the Roto-Clone to overhead installation where floor space is limited are evident in the installation illustrated. Send for free Roto-Clone Bulletins . . . there's no obligation.

AMERICAN AIR FILTER COMPANY, Inc.
Incorporated
266 Central Avenue, Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

AAF

MANUFACTURERS ASSOCIATION, INC. FOUNDRY EQUIPMENT

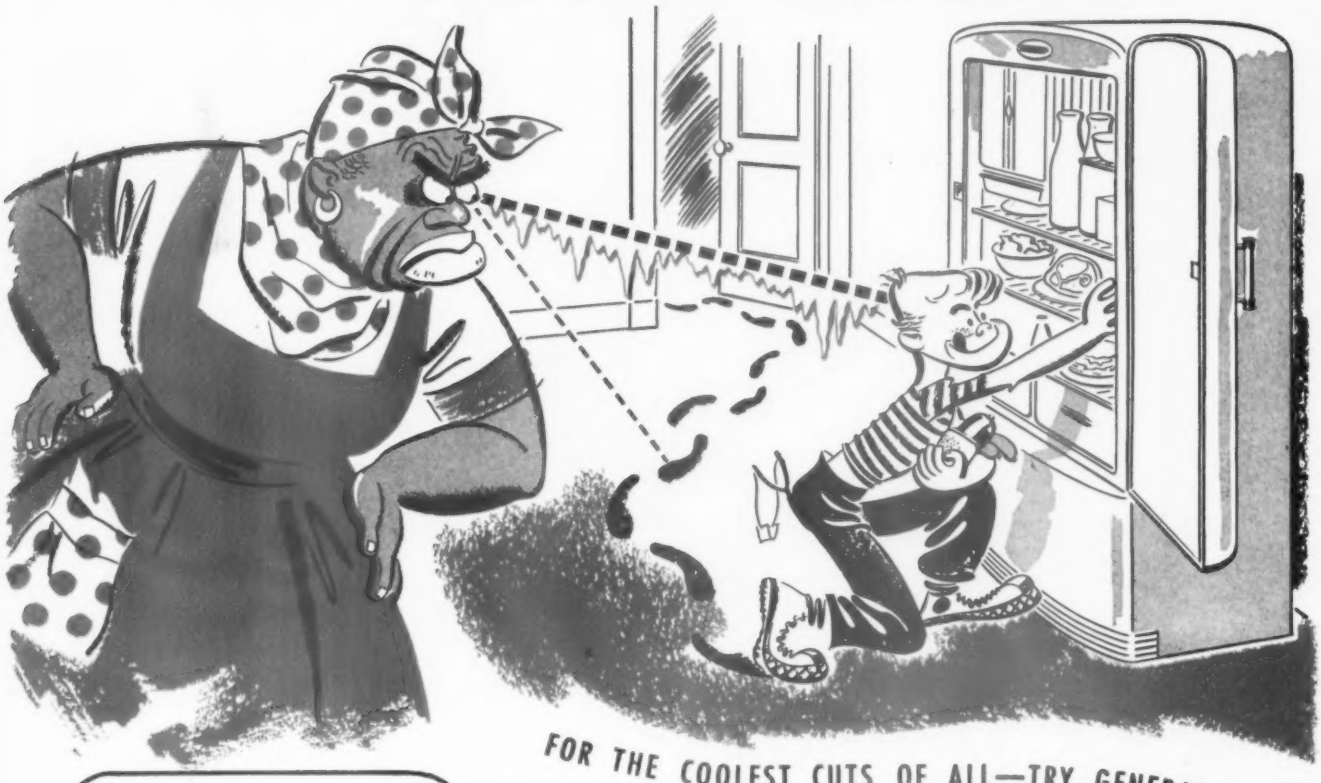
Roto-Clone is a registered trademark for a dynamic precipitator or hydrostatic baffle-type wet collector



ROTO-CLONE
FOR FOUNDRY DUST CONTROL

With Freddie

COLD CUTS COME NATURALLY



FOR THE COOLEST CUTS OF ALL—TRY GENERAL

THERE'S A "GENERAL" WHEEL FOR EVERY TYPE OF GRINDING OPERATION

For Snagging Vitrified and Resinoid Bonds
Trade Names—Aluminoid and Carbonoid

For Cutting Off Rubber, Resinoid and Special Bonds
Trade Names—Westaluma and Westcarbo

For Tool Room Work Vitrified, Resinoid and Rubber Bonds
Trade Names—Aluminoid and Carbonoid

For Polishing and Finishing
Three Grades of Soft Rubber Polishing Wheels
Trade Name—Diamond Brand

Aluminoid — DIAMOND BRAND — Carbonoid
Westaluma — Westcarbo

● All cold cuts are not kept on ice, according to Fred. For years Fred has worked as a grinding wheel operator and Fred says, "If you are really interested in cold cuts, try a 'General Wheel'."

Operators everywhere agree with Fred, for fast, smooth, cool cutting action you can't beat "Generals." "Generals" are easy on the spindles because the arbor holes are made to extremely close tolerances. This eliminates most wheel bouncing and vibration. General cut-off wheels are fitted with special aluminum bushings to prevent spindle scoring and damage through careless mounting.

Try a "General Wheel" yourself and notice how it removes stock faster, resists loading and lasts longer. You'll increase production, reduce cutting time and get better work. Ask for a demonstration now.

SPECIAL—Reserve your copy of our valuable new catalog (now on press) by writing today. Dept. J-1.

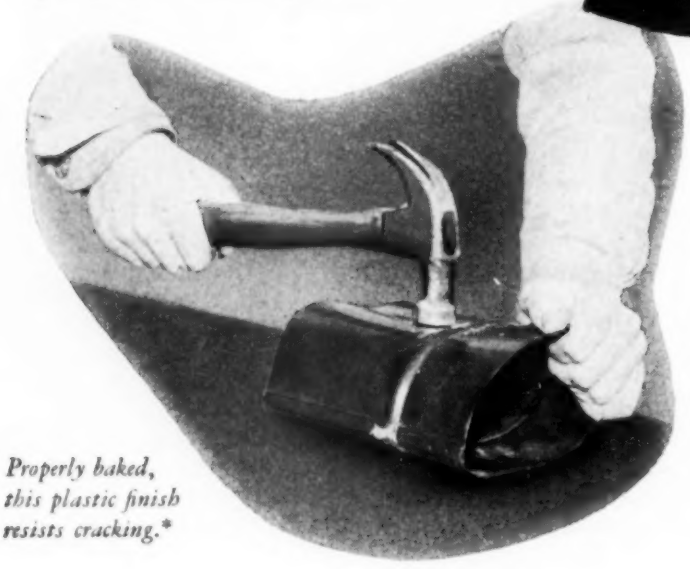
GENERAL GRINDING WHEEL CORPORATION

(WEST ABRASIVES INC.)

3132 E. THOMPSON STREET,
PHILADELPHIA 34, PENNSYLVANIA

*Gas-fired polymerizing oven being charged with plastic-coated aluminum flue liners.**

gas and plastics change the face of things



*Properly baked, this plastic finish resists cracking.**

Plastic coating of metal parts expands the whole field of applications for both metals and plastics. By varying the chemical composition of the plastic an infinite variety of new surfaces can be created for metals.

An essential element in the perfect union of metal and plastic is heat—clean, dependable, accurately-controlled heat—the kind obtained with modern Gas-fired ovens.

Experienced producers of plastic-coated metals, such as Heremetal Company, Minneapolis, Minnesota, use GAS for polymerization ovens because GAS insures the uniform heat, rapid response to heat control, and exact temperatures so essential to processing.

Wherever there's a difficult industrial heating problem there's a job for GAS. Don't forget that the Industrial Representative from your local Gas Company will give you up-to-date information on the latest developments of Gas equipment for your heating requirements.

**Photos courtesy of Despatch Oven Co., Minneapolis, Minn.*

MORE AND MORE...

THE TREND IS TO GAS

FOR ALL INDUSTRIAL HEATING

AMERICAN GAS ASSOCIATION

420 LEXINGTON AVENUE, NEW YORK 17, N.Y.

72000 c.f.m.

by 4 SCHNEIBLE DUST COLLECTORS SERVE THIS LARGE STEEL FOUNDRY

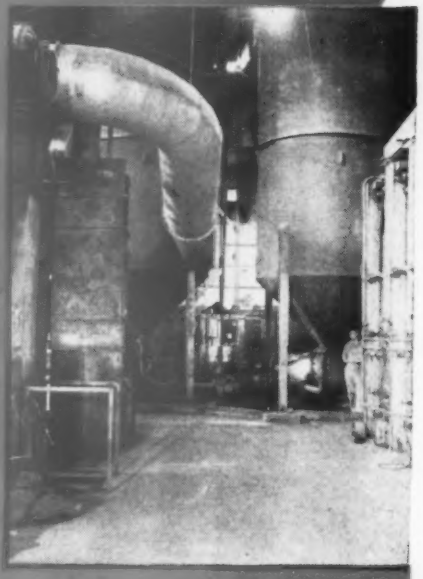
A large midwestern foundry, making steel mill equipment and heavy steel castings, has installed the Schneible dust control system partially pictured in the illustrations herewith.

Four Schneible Multi-Wash Dust Collectors with a total capacity of approximately 72,000 c.f.m. maintain clean air in the sand preparation department, shake-out, blast cleaning and tumbling mills.

The dust from these operations is efficiently removed from the working zones through a ducting system designed by Schneible engineers. As many ducts as desired, from as many operations as desired, may be introduced into a single Schneible Multi-Wash Collector without tie-in tees and elbows—a characteristic which reduces the ductwork required, as well as duct wear and back pressure.

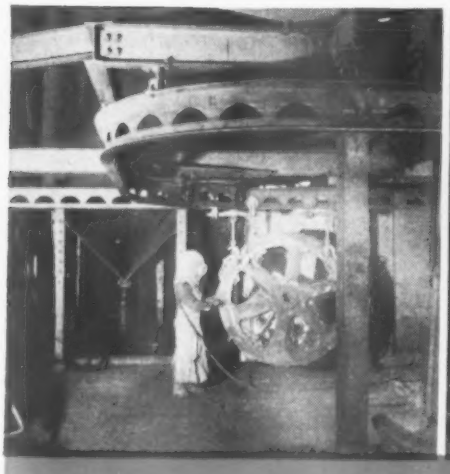
In the Schneible Multi-Wash Collectors, the dirty air is thoroughly cleaned by the basic, impingement plate, wet method, which requires no attendance and a very minimum of maintenance. There is no bothersome accumulation of dust to require disposal. The collected sludge flows to Schneible Dewatering Tanks, where the sludge is settled out and the water is reclaimed for repeated use in the collectors.

This is one of many foundries which have disposed of their dust problem permanently with a Schneible Multi-Wash System. May we give you details on how Schneible Systems will improve working conditions in your foundry?



CLAUDE B. SCHNEIBLE CO.
2827 Twenty-Fifth St.
Detroit 16, Mich.
Engineering Representatives in Principal Cities

MANUFACTURERS ASSOCIATION INC. FOUNDRY EQUIPMENT

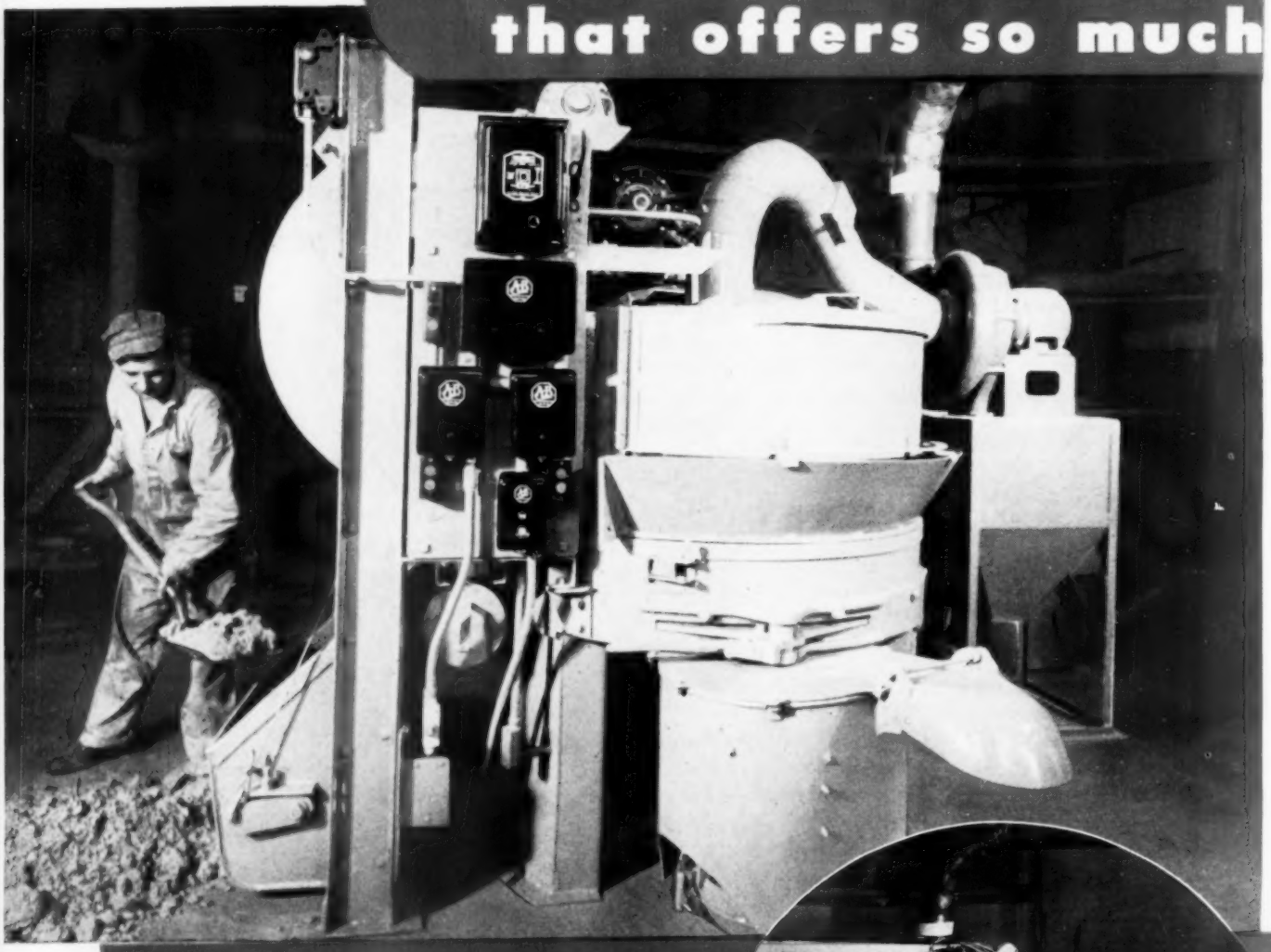


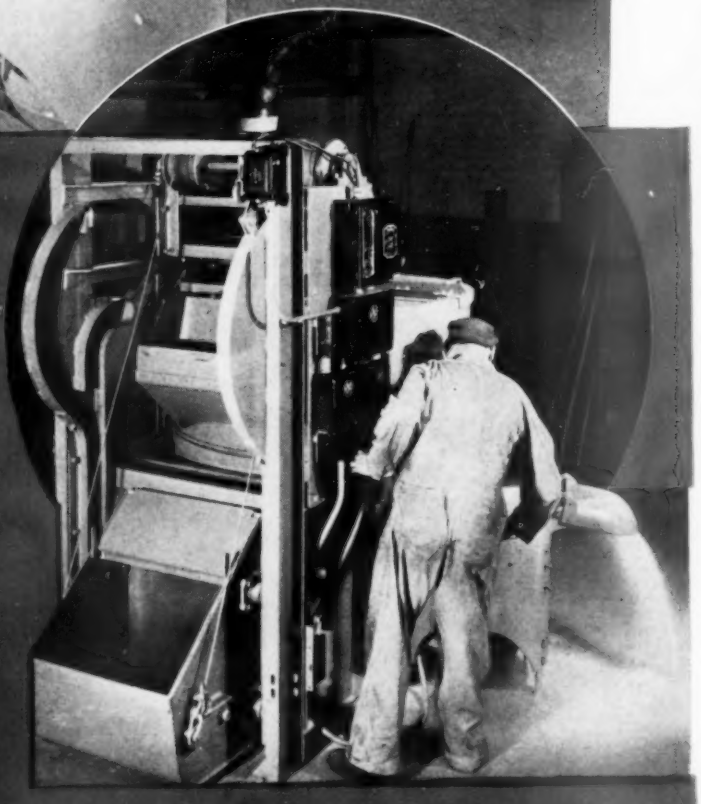
LABOR TURNOVER IS LOWER IN FOUNDRIES USING SCHNEIBLE DUST CONTROL SYSTEMS

SCHNEIBLE

LIQUID-VAPOR INTIMATE CONTACT EQUIPMENT for DUST COLLECTION ABSORPTION CONDENSATION AND TEMPERATURE REDUCTION

you have never seen that offers so much





Above: This photo illustrates the small amount of floor space actually required by this compact National-Simpson unit. The National Bucket Loader at the left contributes to more uniform mixing because the full load is delivered into the mixer at once so no one part of the batch is mulled for a longer period of time. Although mixer can be manually loaded from floor, the Bucket Loader actually doubles the production capacity of the mixer over manual loading, as one charge can be prepared and ready as soon as mixing of preceding charge is completed.

Circle: Here, the sand is being discharged from the National Aerator after mulling. Use of the Aerator increases sand flowability, aids in the production of smooth-surfaced, clean castings. Discharge chute is at proper height for spilling sand into wheelbarrows.

The photo on the right shows the Simpson Mixer and Aerator with discharge in the foreground, and the Exhaust Unit at the right. This Exhaust Unit provides simple, inexpensive and positive fines control. The cooling hood on the Simpson Mixer cools sand that has become overheated by frequent use.

such a compact unit sand control efficiency!

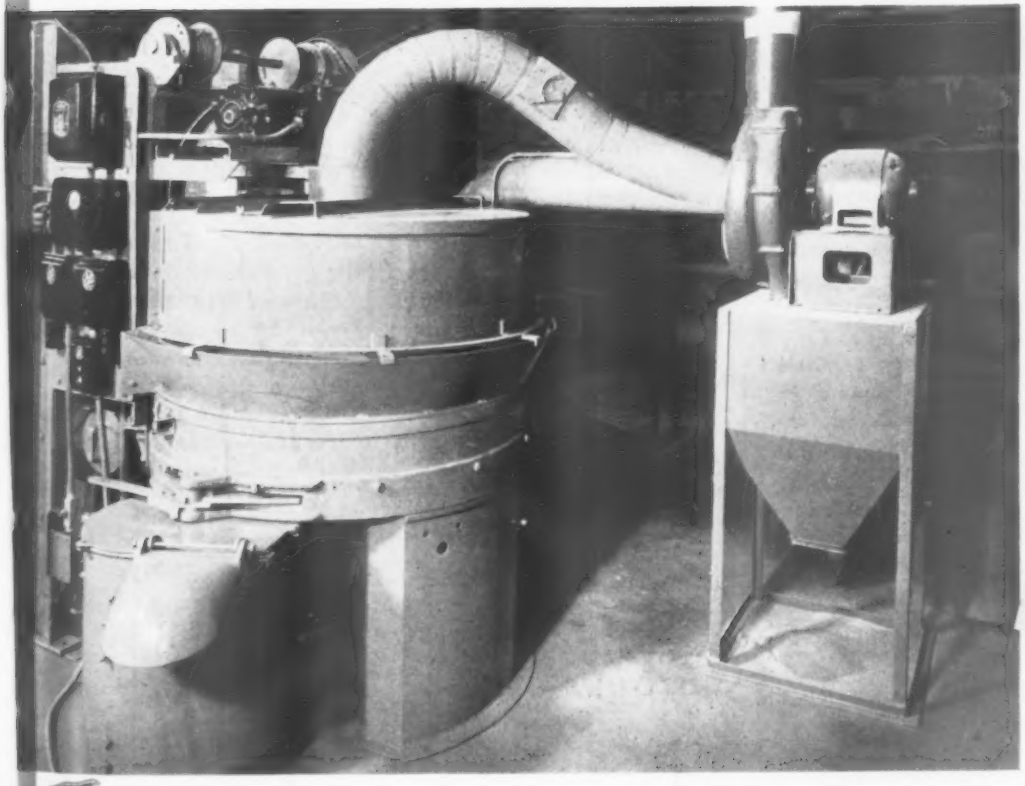
. . . it's a NATIONAL-SIMPSON

Designed especially to give better sand preparation at lower cost—for small foundries, or for special jobs in larger foundries.

To turn out the best castings at the lowest cost, smaller foundries need efficient sand preparing and handling equipment too—equipment that is economical to buy and operate. The answer is this National No. 1-H unit—a complete, compact sand handling and preparing system. It affords the same operating efficiency and superior results as the larger Simpson Mixers and National Auxiliary Equipment.

The system includes a Model 1-H Simpson Mixer, National Bucket Loader, Aerator, Exhaust Unit and control panel—closely integrated to achieve maximum efficiency in the handling and the processing of sand where tonnage requirements are small.

While the National 1-H system was designed for all types of small foundries, larger foundries too will find it especially useful for special jobs. If yours is a small foundry, or if you have special problems—why be handicapped with inadequate or inefficient equipment—The National 1-H was made for you. Write today for special bulletin on the No. 1-H unit.



This 64-page Simpson Handbook tells the complete story of better sand control. If you haven't a copy, we'll be glad to send you yours without obligation.

NATIONAL ENGINEERING COMPANY

MACHINERY HALL BUILDING • CHICAGO 6, ILLINOIS

Manufacturers and Selling Agents for Continental European Countries—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd. Sydney, Australia

MANUFACTURER'S ASSOCIATION FOUNDRY EQUIPMENT

3,560 POUND HEATS EVERY 2 HOURS

from *Electro's* new

TERCOD CONQUEROR Long-Lipped CRUCIBLES

IN OIL OR GAS FIRED TILTING-TYPE FURNACES

Heats of 3,560 pounds of manganese bronze are being poured every two hours from oil-fired, tilting crucible furnaces.

Similarly heats of 4,000 pounds of brass, copper and other copper alloys are now common pouring practice.

Crucible melting of aluminum and its alloys in half-ton lots is an eagerly adopted custom today.

Electro's new Tercod CONQUEROR 2-TON CRUCIBLES make this high-speed handling of big loads possible. War production proved their economy, dependability and general superiority.

Authentic data (Bulletin Cr-147 on request) prove that Electro Tercod Crucible melting combines economy with speed and higher quality production.

Tables show how costs per ton sum up to only $5.28 with CONQUEROR Crucibles (in oil-fired tilting-type furnaces) as against $8.37 per ton in electric furnaces and $10.72 in open flame furnaces. These figures include fuel, energy, maintenance, depreciation and metal melting losses.

Tercod Crucibles are superior for aluminum, copper, brass, bronze, zinc, high carbon gray iron, leaded bronzes and copper nickel alloys, silver, gold and comparable metals. You'll gain 10 important ways by switching to Electro's Big-Tonnage Tercod CONQUEROR CRUCIBLES!

LOW COST
$5.28 *compared with* $8.37 & $10.72

Electro's New Tercod CONQUEROR Big-Tonnage Crucibles for oil or gas fired, tilting-type furnaces now offer capacities comparable to those of less satisfactory types; and assure the quality and economy gains from elimination of the characteristic high oxidation, burning and gassing of melts in open flame, cupola, electric arc, electric induction and similar furnaces whose chief claim for past preference was based on volume production.

Write us your needs.

•

Request our **BULLETIN Cr-147**

Electro TRADE MARK SINCE 1919

K-104

Electro REFRACTORIES & ALLOYS CORPORATION

MFRS. · REFRACTORIES · CRUCIBLES · STOPPERS · ALLOYS · GRINDING WHEELS

344 DELAWARE AVENUE — West Coast Warehouse Los Angeles — BUFFALO 2, NEW YORK

15 TONS A DAY CLEANED . . .

fewer man-hours

NO DUST

How a costly and exasperating log-jam was Hydro-Blast-ed — permanently! — is told by General Iron Works Company of Denver, Colorado.

Says the superintendent, "Our cleaning room was a serious bottle-neck. Even with several chippers at work full time we lagged days behind."

Then Hydro-Blast was installed. Now . . .

- **approximately 15 tons of iron a day go through Hydro-Blast**
- **chipping is on a day-to-day basis —no bottle-neck**
- **big cut in man-hours**
- **no dust!**

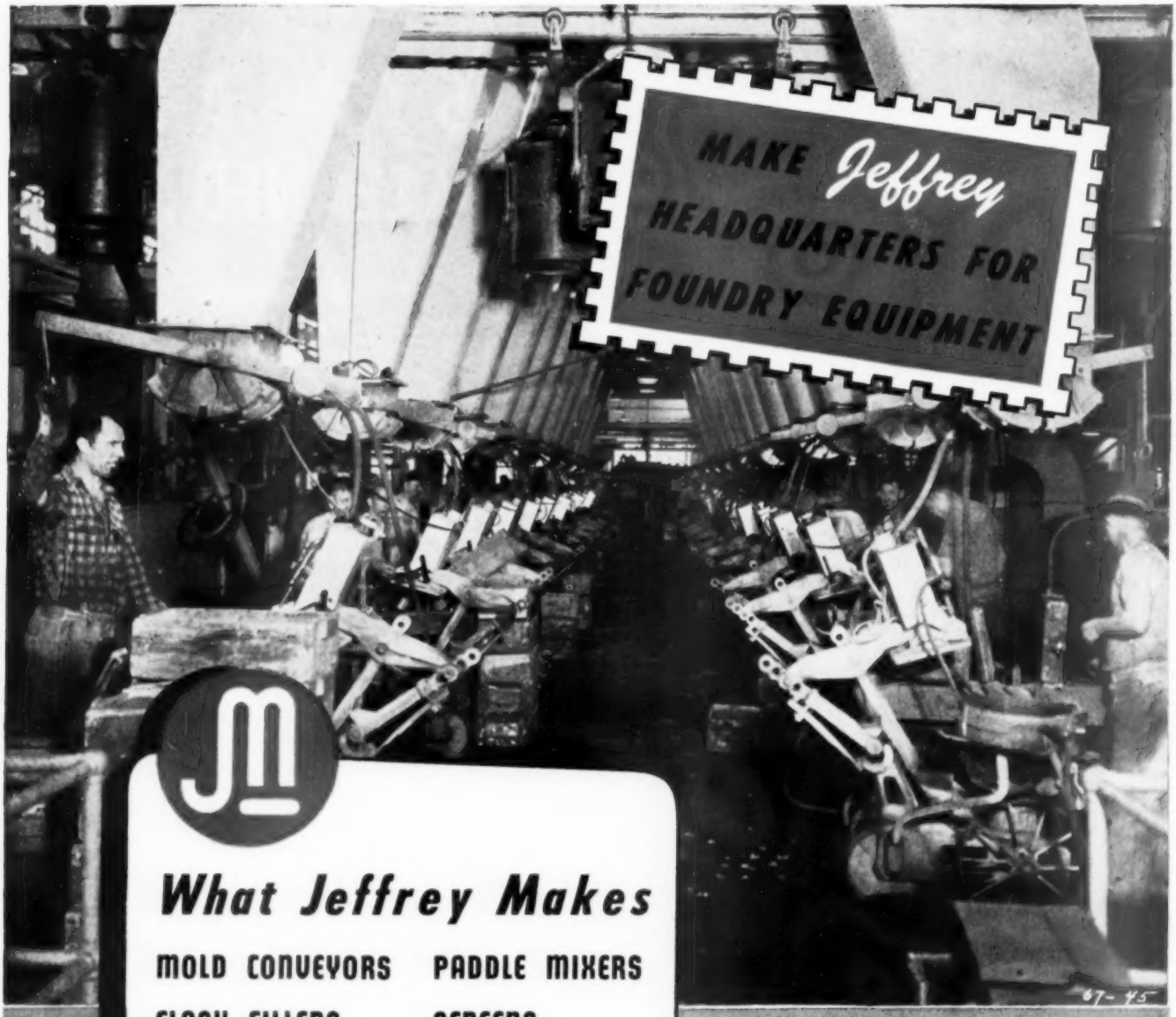
You can confidently expect similar benefits in your foundry, no matter what you pour—iron, steel, non-ferrous.

It costs nothing to find out about Hydro-Blast's extraordinary money-saving advantages—and may cost a good deal not to. Write for an appointment with Hydro-Blast engineers.

HYDRO-BLAST

Chicago 47, Illinois

2550 NORTH WESTERN AVENUE



What Jeffrey Makes

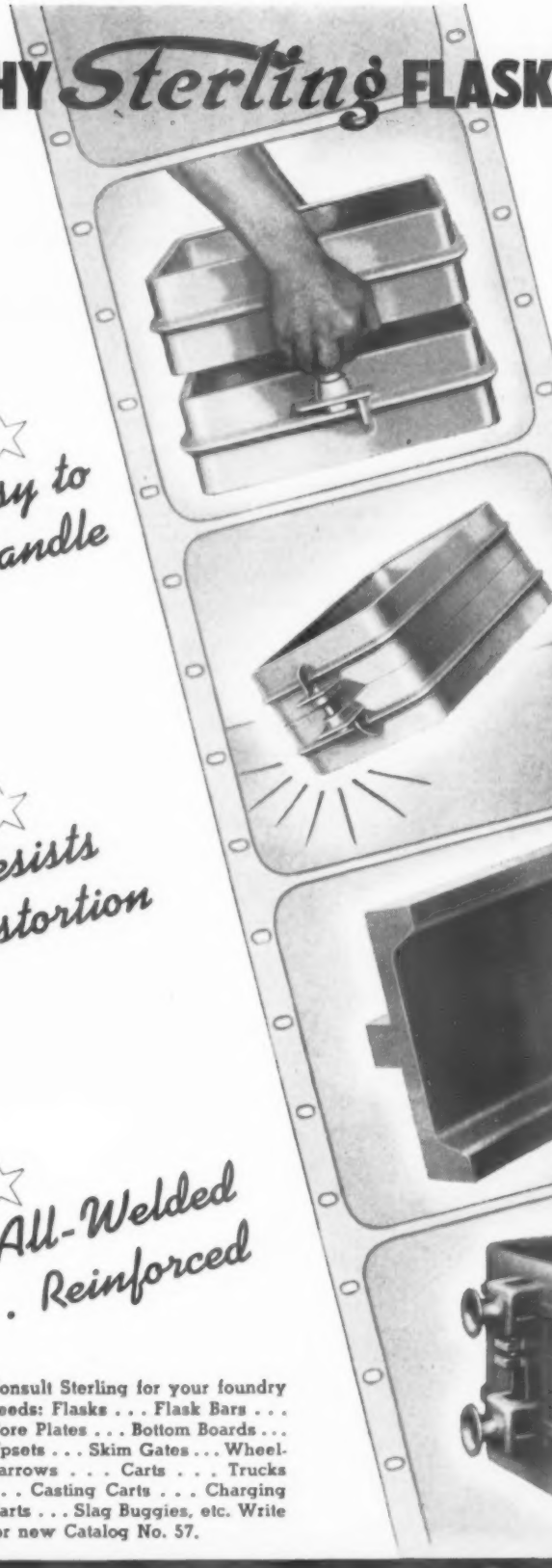
MOLD CONVEYORS
PADDLE MIXERS
FLASK FILLERS
SCREENS
AERATORS
BIN VALVES
SANDITIONERS
CONVEYORS
BUCKET ELEVATORS

A Typical
Double-Squeezer
Molding Line

THE JEFFREY
MANUFACTURING COMPANY
907-99 North Fourth St., Columbus 16, Ohio

ESTABLISHED 1877

WHY *Sterling* FLASKS ARE STAR PERFORMERS



Easy to Handle

Resists Distortion

All-Welded . . . Reinforced

For real economy and lasting service, Sterling Steel Flasks are star performers in more than 4,000 American foundries. Properly engineered and built for long life, Sterlings provide a combination of maximum strength with minimum weight. All-welded construction . . . sturdy, reinforcing ribs . . . square flanges . . . full-width bearing. These exclusive Sterling features insure longer service life at lower cost.

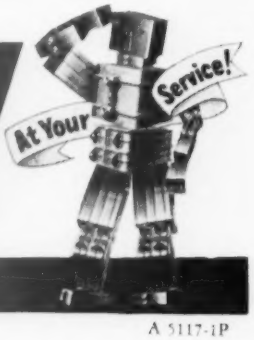
Style "⅜ NT-NNT" Heavy Duty Flask with Clamping Bars and Clamps.

Style "LL" with Angle Reinforcement and Two Man Lift Handles.

Style "⅜ NNT" Heavy Duty Flask. (Pat. 1974292)

Consult Sterling for your foundry needs: Flasks . . . Flask Bars . . . Core Plates . . . Bottom Boards . . . Upsets . . . Skim Gates . . . Wheelbarrows . . . Carts . . . Trucks . . . Casting Carts . . . Charging Carts . . . Slag Buggies, etc. Write for new Catalog No. 57.

Sterling FOUNDRY FLASKS



STERLING WHEELBARROW COMPANY • Milwaukee 14, Wis., U.S.A.

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ENGINEERING ABILITY

DSM

BACKED BY 30 YEARS OF EXPERIENCE

DETROIT SHEET METAL WORKS
DETROIT, MICH. U.S.A.

EXPERIENCE and ability acquired in thousands of installations are at your service when selecting D.S.M. equipment.

D.S.M. case histories have been derived from equipment furnished to plants throughout U.S.A. and to Dagenham, England; Clichy, France; Bombay, India; Batavia, D. E. I.; Sao Paula, S. A.; Turin, Italy; etc. D.S.M. equipment means rapid cross flow circulation for speedy and uniform drying or baking. This eliminates case hardened products.

If you wish to convert your present system to the new postwar economy, it will be to your advantage to try our Go-Out Plan. This means that you will enjoy the services of our highly experienced engineers, who will personally inspect your system and work together with the various departments in your plant in need of special help. Their recommendations for whatever new installations may be required will place you in a position to secure a layout that will more than justify your outlay.

DETROIT SHEET METAL WORKS, 1270 OAKMAN BLVD., DETROIT 6, MICHIGAN

PLANT ENGINEERING: *Consulting assistance in plant layout to coordinate departmental operations, our experience dated from 1917 in this field.*

Such plant layout may be based on increasing production beyond present capacity, or it may be a rearrangement in this post-war period when operations are conducted under a new set of conditions.

MOTOR CLEANING EQUIPMENT: *Washing machines for cleaning tear-downs. Kerosene spray or similar solvent usually used as the cleaning medium.*

FORMED COWLINGS, PANELS, ETC.: *To your specifications, and of light metal alloys as required. Weldments and brazed assemblies may be under controlled atmosphere.*

PILOT EQUIPMENT: *Sample size equipment for development of heavy equipment.*

VERTICAL CORE BAKING OVENS • CONTINUOUS HORIZONTAL BAKING OVENS • BATCH TYPE CABINET OVENS • DRAWER OVENS

DETROIT SHEET METAL WORKS

DETROIT -6- MICHIGAN

NONE BETTER

MELTRITE

PIG IRON

Exactly What the Name Implies

More USED than Any Other
Merchant PIG IRON—
Such Preference Must Be Merited

PICKANDS MATHER & COMPANY

CLEVELAND • CHICAGO • ST. LOUIS • ERIE
DULUTH • MINNEAPOLIS • TOLEDO

P M

IRON ORE • PIG IRON • COAL • COKE

. . . and put an end to its excessive prices

WHAT you're paying for dust is probably a lot more than it would cost to get rid of it. Dust—even invisible dust—is a constant drain on efficiency, product quality, lighting, worker morale, plant maintenance. Eliminating it costs relatively little for initial investment, practically nothing for operation.

Let Pangborn—*world's largest manufacturer of dust control and blast cleaning equipment*—survey your plant to uncover costly "dust pockets". A "Dust Pocket Survey" is made by qualified engineers, with no obligation. Also write for Bulletin 909A which describes cost-cutting opportunities with dust control and exclusive features of *Pangborn* dust control equipment. Address Pangborn Corporation, 300 Pangborn Boulevard, Hagerstown, Md.

Pangborn

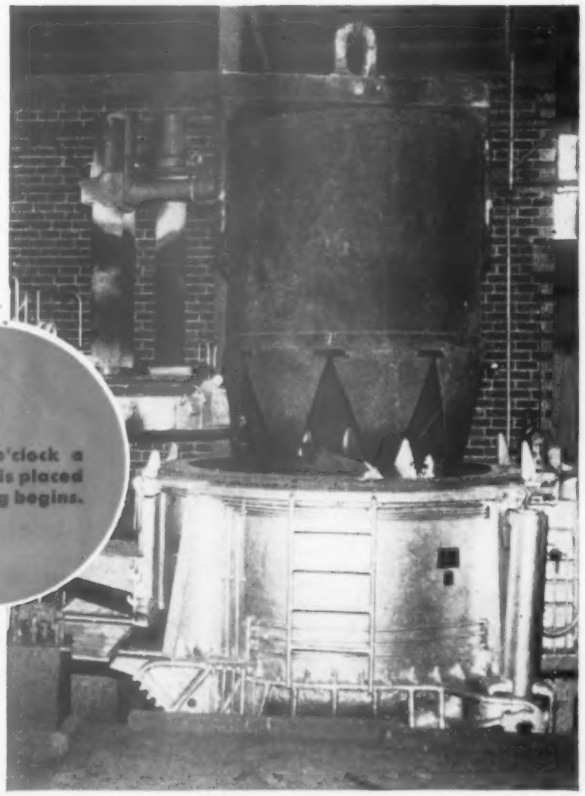
DUST CONTROL

PANGBORN CORPORATION HAGERSTOWN, MARYLAND

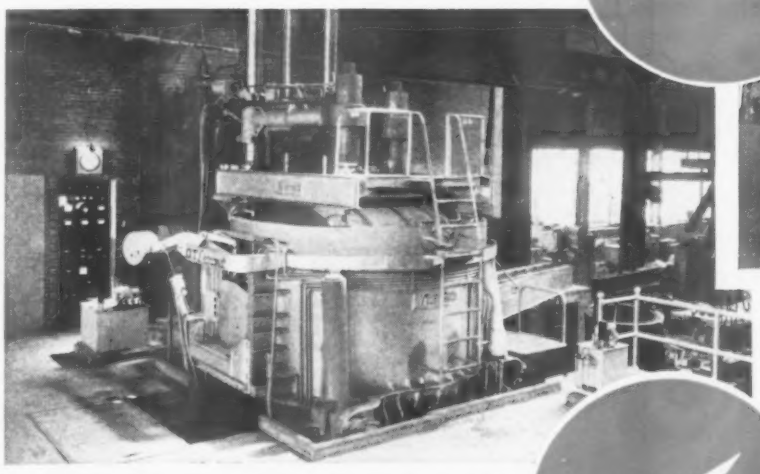
TURNS DUST LOSSES INTO PROFITS

12 TONS - 100 MINUTES

THAT'S *Clockwork Economy* IN METAL MELTING

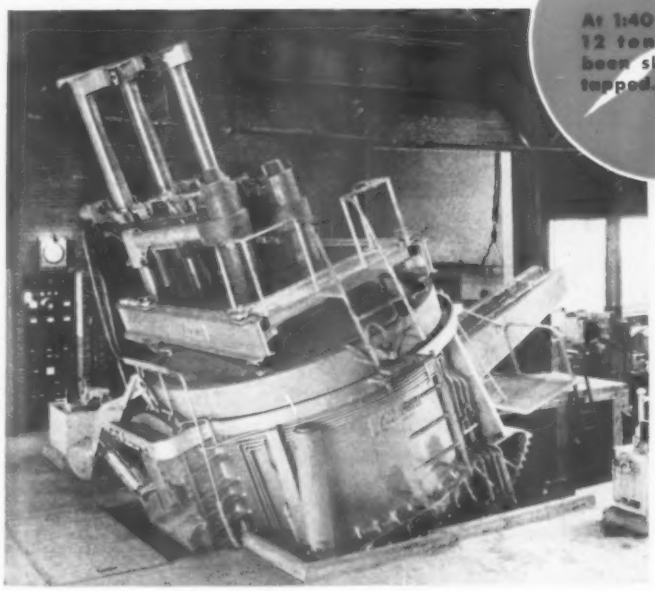


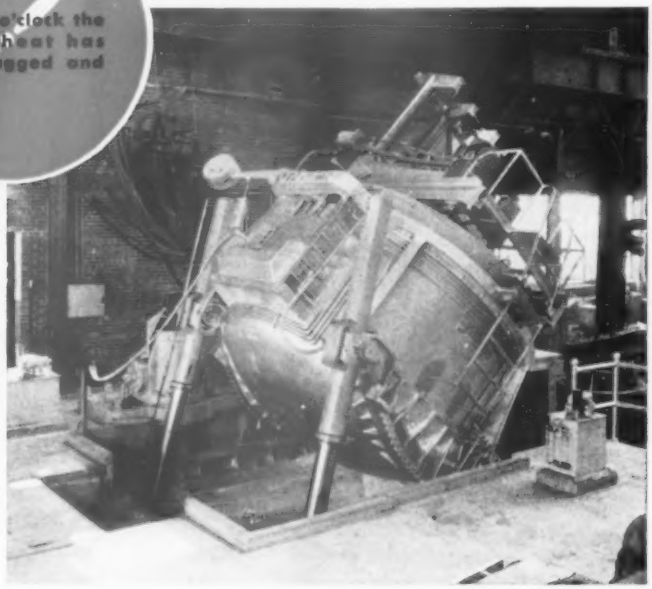
At 12:00 o'clock a full charge is placed and melting begins.



This furnace is size OT (usual heat size 10 to 12 tons). Other equally fast and economical Lectromelt top charge furnaces are available in capacities ranging from 100 tons down to 250 pounds.

At 1:40 o'clock the 12 ton heat has been slagged and tapped.



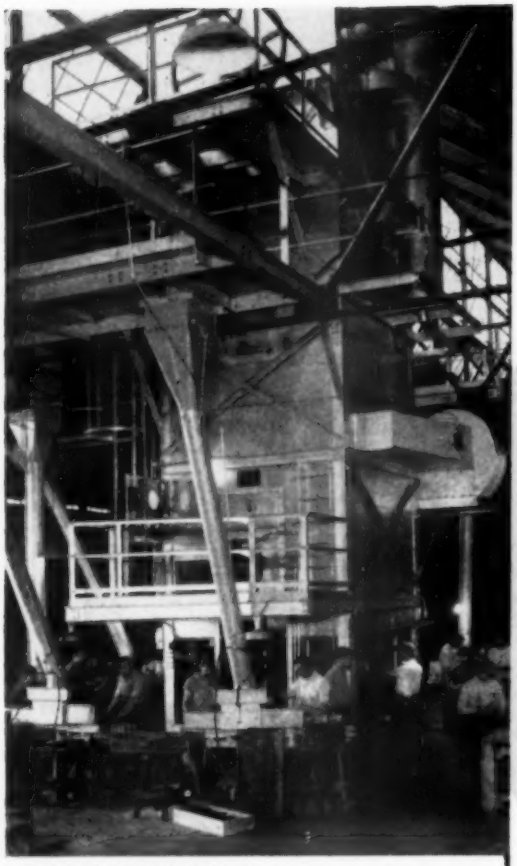


MOORE RAPID *Lectromelt* FURNACES

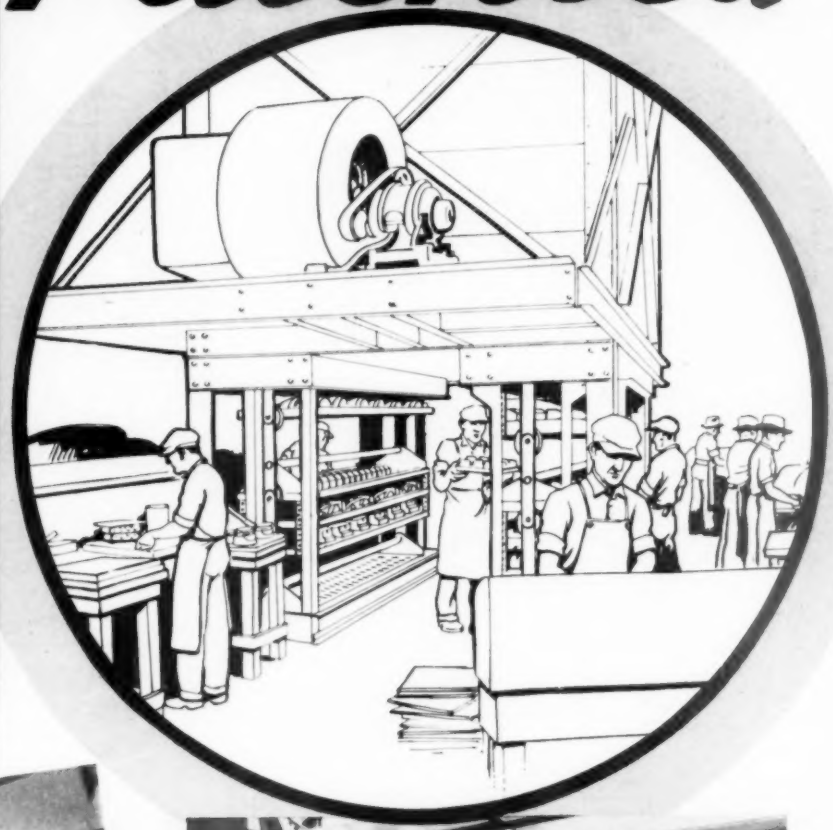
PITTSBURGH LECTROMELT FURNACE CORPORATION

PITTSBURGH 30, PA.

Patented



MALLEABLE IRON. Note close grouping around this Coleman Tower Oven with Patented Open Loading Center.



MEEHANITE. Coleman Tower Oven in leading foundry producing Meehanite castings. Coremakers placed around three sides of Tower, with unloading of baked cores in foreground.

GRAY IRON. Another example of close grouping of coremakers around Coleman Tower Oven made possible by the Patented Open Center. Jobbing iron foundry.

COLEMAN
CORE *and* MOLD
OVENS

The **FOUNDRY EQ**
CLEVELAND 13 OHI
BUILDERS OF COLEMAN AND

OPEN CENTER

Exclusive Advantage of

COLEMAN TOWER OVENS

THE PATENTED OPEN CENTER FEATURE makes Coleman Tower Ovens the fastest loading vertical ovens built. It permits loading from both inside and outside the Tower, thereby increasing loading accessibility by as much as 300% over other vertical oven designs. The center loading aisleway enables close grouping of the core-makers around three sides of Tower, saves many steps between bench and oven. Handling labor is reduced to a mere fraction.

COLEMAN TOWER OVENS IMPROVE WORKING CONDITIONS. Cores are cooled and "smoked-off" before they reach the unloading position, permitting immediate handling. No uncomfortable heat, acrid fumes or gases to interfere with worker efficiency.

COLEMAN TOWER OVENS BAKE PERFECTLY, eliminating the cost of rejects and make-over labor.

INVESTIGATE NOW! Ask us to give you full details and refer you to users. The verdict of leading foundries is significant.

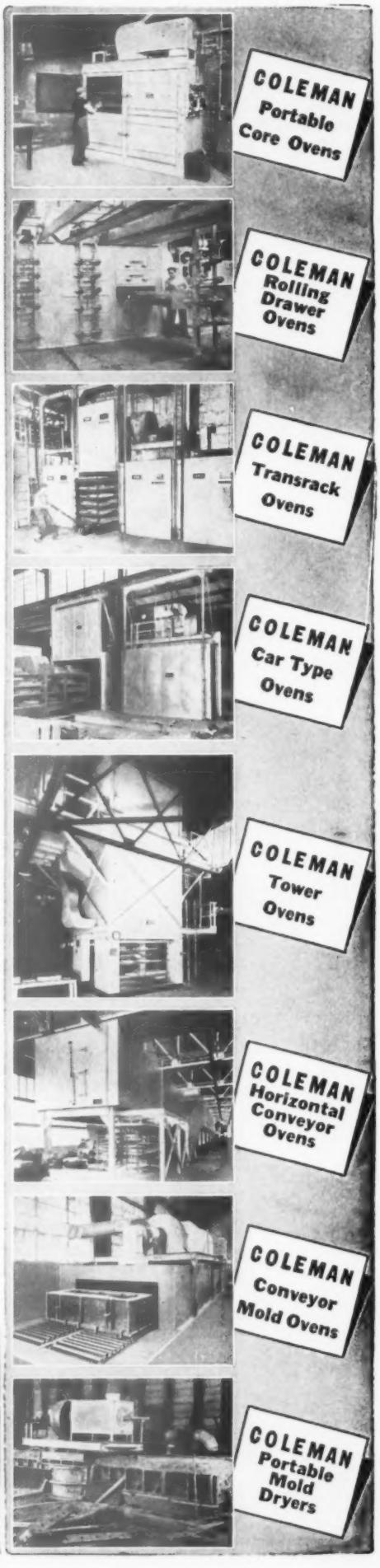
CLOSE-UP of Open Center of large Coleman Tower Oven in aluminum foundry. Note accessibility of both "up" and "down" conveyor lines.

Coleman Ovens are also built in all conventional and special designs to meet every possible requirement in core baking and mold drying. Heating systems can be furnished to use the most economical fuel available in your locality—gas, oil, stoker coal, electricity, etc.

●

OVER 9,000 SUCCESSFUL INSTALLATIONS

WRITE FOR FOLIO OF BULLETINS



RY EQUIPMENT *Company*

D 13 OHIO, U. S. A.

MEMBER

AN AND SWARTWOUT OVENS

Of Course You Want To Make 1947 A Banner Year!

Here's How to Do It!

Begin Now to Regularly Use

CASTFLUX
Trade Mark Reg.

The "National" FLUX

You will achieve notable economies in foundry operation and decided improvement in the quality of metal—the oustanding results of the use of Castflux in iron, steel and malleable iron foundries.

Castflux has been accepted by hundreds of foundries for regular use on the riser and as an inoculant in the ladle because

they are obtaining a greater percentage of sound castings, less remelting, and a smoother stepped-up production.

Castflux functions so successfully because

The Castflux formula consists of ingredients in correct proportions established by scientific research to produce a definite exothermic action.

Castflux is so much further advanced chemically and metallurgically because

of constant research in Castflux laboratories implemented by personal contact with foundry superintendents and foremen.

Castflux is always dependable because

of Consistent Uniform Quality.

Castflux instituted an unconditional guarantee because

Castflux lives up by performance and results to every claim presented by the

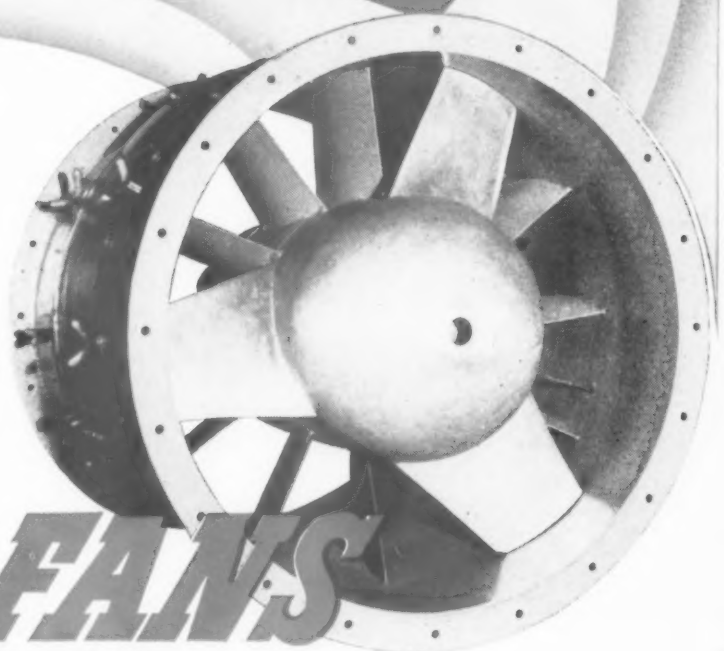
NATIONAL

PIGMENT COMPANY

2115-2117 E. YORK ST., PHILA. 25, PA.

QUIET

and Trouble Free



La-Del Axial Flow Fans operate more quietly than ordinary types because there is less turbulence in the air they produce. Less power is needed to move any given amount of air with a La-Del fan . . . further reducing noise. And, La-Del's sturdy, precision engineering guarantees long life and freedom from maintenance troubles.

Many standard models will soon be in production. In the meantime, a Joy engineer is available for consultation on special problems that you may be encountering in new designs.

LA-DEL FANS

(TROLLER DESIGNED)

Featuring

VANE-AXIAL FLOW AERODYNAMICS

GUARANTEED LOW COST OPERATING EFFICIENCY

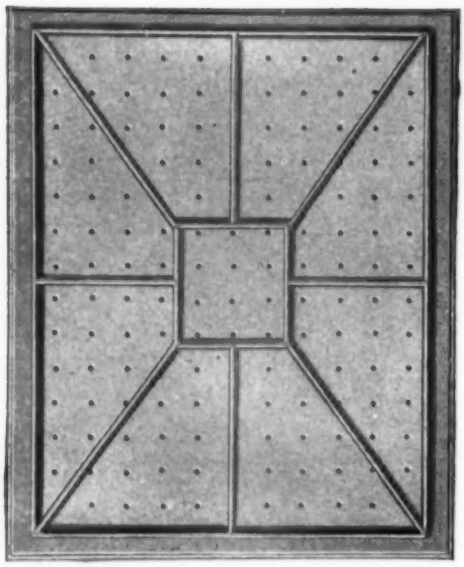
Consult a Joy Engineer

LA-DEL Division

JOY MANUFACTURING CO.

GENERAL OFFICES: HENRY W. OLIVER BLDG., PITTSBURGH, PA.

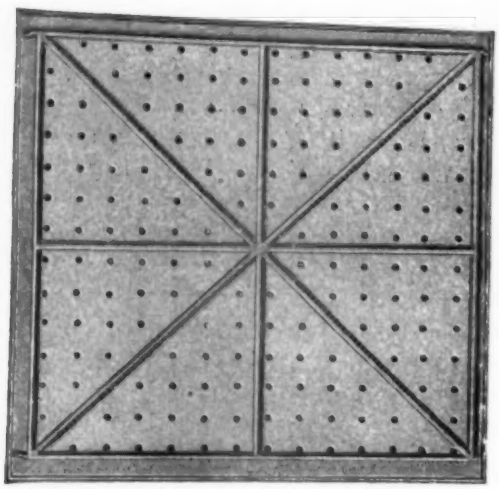
"DIAMOND" CUSTOM-BUILT CORE PLATES



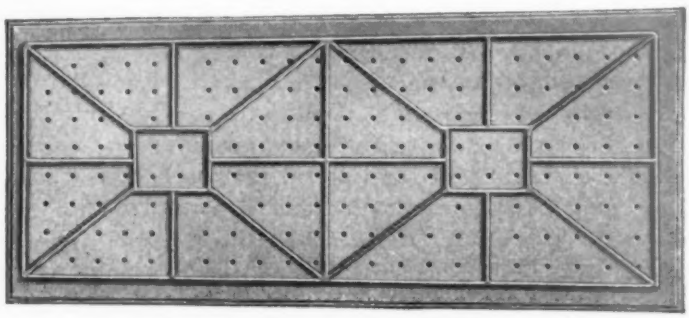
STYLE CP-3 — This type reinforcing on "square" plates for loads up to 1200 lbs. Typical sizes run 40" x 50" and 36" x 60".

CARRY CORES UP TO 1200 LBS. WITHOUT DEFLECTION!

Less baking time with Diamond Plates . . . because sturdy construction with light weight is achieved. They heat up and cool more quickly. Fabricated from ½" or heavier plate as indicated to meet load requirements, users acclaim the long-life and uniform quality of Diamond Plates. Available in special and standard sizes to suit your exact requirements.



STYLE CP-1 — This construction used on plates in the 30" x 30" range for core loads up to 200 lbs.



STYLE CP-2—For long and narrow cores and loads to the 1200 lb. range. Note web-bracing construction.

HOW TO ORDER DIAMOND CORE PLATES

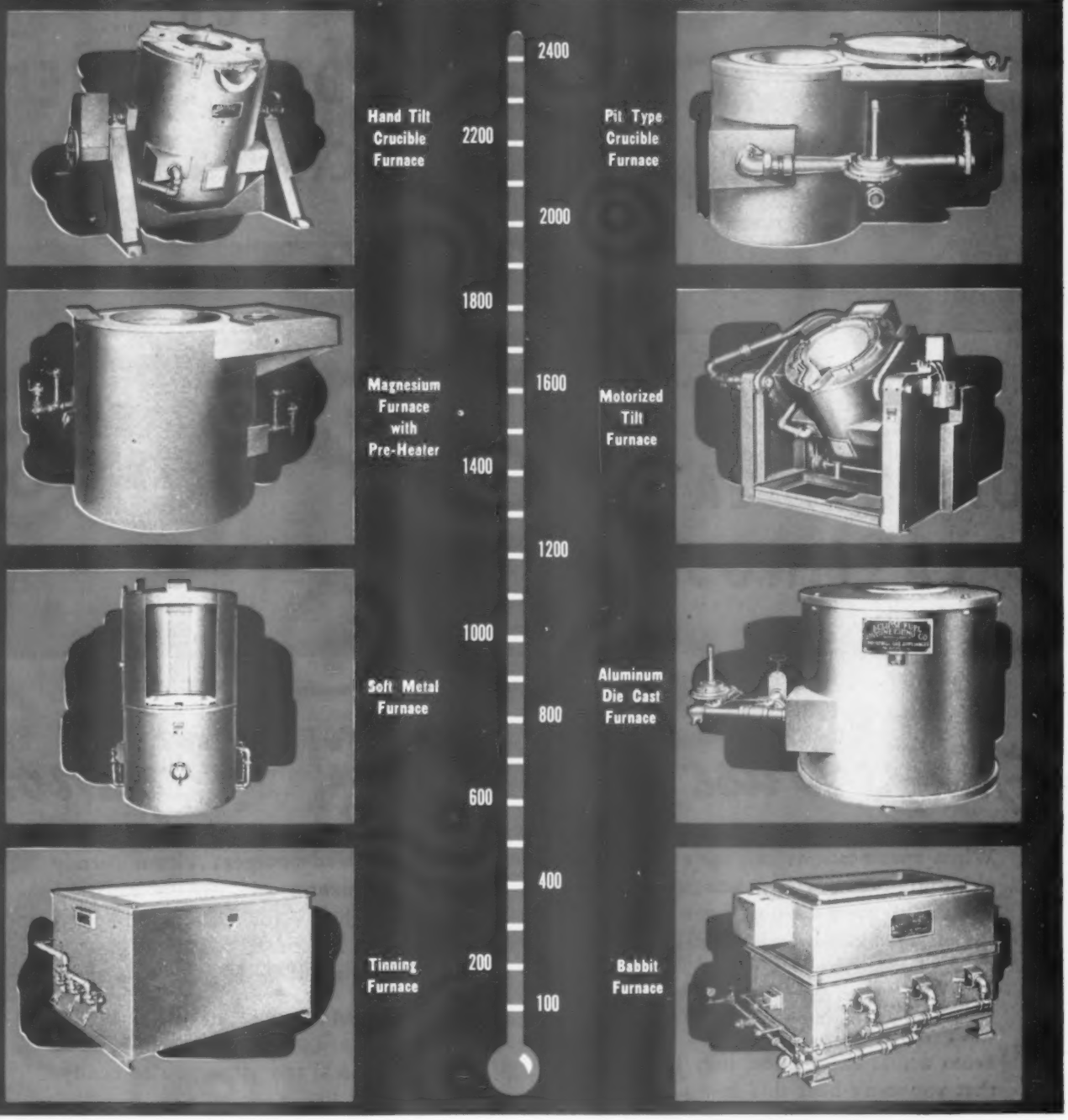
Since we recommend "job fitted" plates for real production efficiency, we suggest your telling us *how heavy your core loads will be* and the *approximate overall plate size*. We will design reinforcing accordingly, and quote in terms of plates best suited to your needs.

DIAMOND

Telephone 2553 — CLAMP AND FLASK COMPANY — Richmond, Indiana

Designers of* CORE PLATES, JACKETS, BANDS, FLASKS *since 1889

What Degree "FURNACE HEIT"?



Whether it's brass, bronze, magnesium, aluminum, tin, lead or a soft metal, a suitable Eclipse Melter can be selected for your requirements.

Backed by over a quarter of a century of experience and development, you are assured of a unit constructed to give the minimum of maintenance at an economical operating cost.

Consult our representative in your locality regarding your requirements.

Eclipse Fuel Engineering Company
ROCKFORD **ILLINOIS**

McKee Eclipse

FOR PREDETERMINED MACHINABILITY

IN LARGE OR INTRICATE CASTINGS . . .

it pays to use CHATEAUGAY *Pig Iron*

When specifications call for extensive machining operations, as was true with the tire mold shown above, many cost-wise foundrymen make it a point to use Republic CHATEAUGAY Pig Iron.

Why? Because they know that CHATEAUGAY *consistently* outperforms other irons. From actual experience, they have learned that you can't beat this low phosphorous, copper-free pig iron for milling, drilling, turning or other machining qualities.

Equally important are CHATEAUGAY's other profitable advantages . . . its uniformly fine grain structure and density . . . its strength, toughness and hard, wear-resisting surfaces . . . and its ability to fill the most intricate mold completely.

A Republic Pig Iron Metallurgist will give you the complete story about CHATEAUGAY any time you're ready. Write directly to:

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

Republic PIG IRON

"CHATEAUGAY"	"REPUBLIC"	"PIONEER"
Low-Phosphorus, Copper-Free	(Northern) Foundry, Basic and Malleable	(Southern) Foundry and Basic

ALSO TRUSCON FOUNDRY FLASKS • REPUBLIC CORE WIRE • FOUNDRY NAILS

Heavy Demand for Castings Should Continue in 1947

FOR THE first time since 1941, the foundry industry will start a new year without the limitations provided by wartime controls. Lifting of price ceilings on castings and on certain raw materials needed by foundries has removed the last of the restrictions which government placed in effect throughout the period of the war emergency.

The postwar certification plan for pig iron, which was instigated as an aid to the production of castings for G. I. housing, will continue for a few months more. Although the plan has been extended for the first quarter of 1947, the new housing plan of President Truman states that if high production levels of critical building materials are maintained to the end of the first quarter "it should be possible to discontinue raw materials allocations at that time."

While almost complete freedom of operation should permit the foundry industry to do a better job in meeting future demands for castings, removal of controls will not eliminate many problems which hampered production in 1946. Strikes of the past year have resulted in shortages of coke and pig iron, and these undoubtedly will continue well into the new year. The supply of scrap probably will be critical for at least the winter months. Nonferrous foundries will continue to encounter shortages of copper, tin and other nonferrous metals. Numerous foundry supplies will be short for some time to come. While the labor situation has improved, many foundries will continue to need more workers than are available.

What will be the probable demand for castings in 1947? Many in the industry believe that the pent-up demands for products in which castings are used—such as housing, automobiles, household appliances, agricultural implements and railroad equipment, to name only a few of the most important—should provide a satisfactory flow of orders during 1947. Preliminary results on several questions asked in an "Inventory of Equipment" survey now being completed by THE FOUNDRY, show that average foundry operations in the fourth quarter were around 79 per cent of capacity, and the average backlog at that time was 7½ months. In the matter of a long-range look at the future, those participating in the survey "guess" that average operations of the industry for the next five years will be approximately 85 per cent. Complete data on the survey will be presented in an early issue.

With castings providing essential engineering materials for the operation of most metalworking establishments, demand for cast products will follow closely the general trends in industrial production. If labor and management can avoid the wave of strikes that curtailed production during the past year, need for cast products during the next 12 months may be even greater than it was during 1946.

Frank G. Steinbach
Editor

Some Unusual Tests of *cast iron*

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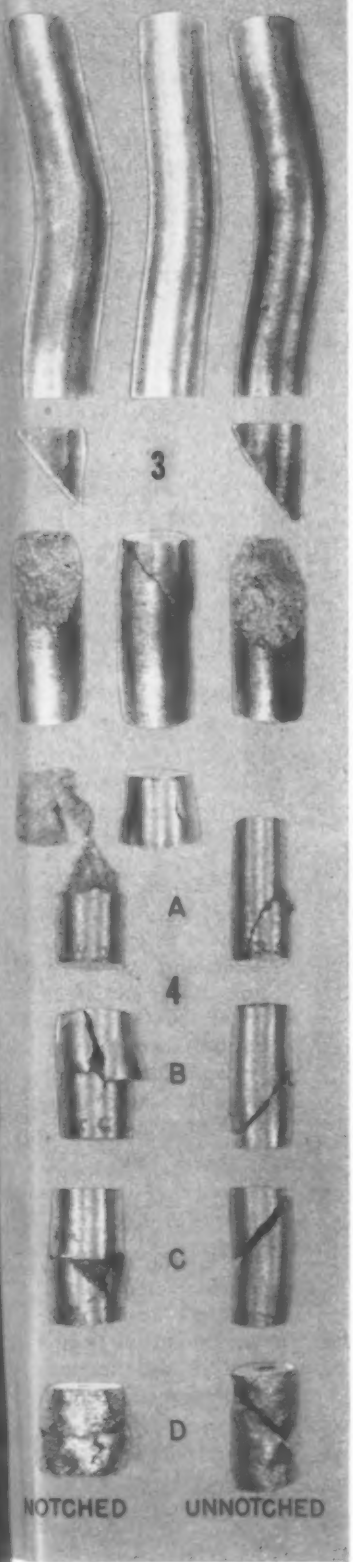
This is the first of two articles describing unusual methods that have been used for testing cast iron. It is based on information assembled by Committee A-3 of the American Society for Testing Materials which is engaged in formulating specifications for iron



UNUSUAL methods of testing cast iron differ from the standard American Society for Testing Materials methods as clearly as research testing differs from routine testing. In the one case the work is on the frontier of science developing new information which requires special specimens and procedures, while in the other case the product under observation undergoes sampling and investigation along established lines to determine the fitness of the material for the intended purpose. In the course of time it is not unusual for the prevailing research method to become a routine method, provided that the experimental work succeeds in defining the properties desired in the material or the casting that is made from it.

With such an objective in view, Committee A-3 of the American Society for Testing Materials which is engaged in formulating specifications for cast iron, set out to assemble some of the available information upon recent unusual methods that have been used for testing cast iron, with the purpose of exhibiting test specimens and some of the results obtained, at the annual American Society for Testing Materials convention. The survey received the support of American Society for Testing Materials Committee A-3 members, and news of developments upon the following tests was obtained:

(a) Bending. (b) Compression. (c) Tensile. (d) Elasticity and Deformation. (e) Torsion. (f) Fatigue. (g) Impact. (h) Corrosion. (i) Heat Resistance. (j) Special Tests (Wear—Damping).

(a) Bending Tests: Laboratories are constantly trying to develop information of value to the designer and builder. Specifications usually define the type of test piece necessary to measure the basic qualities of a cast iron. The arbitration bar type B of Specification A-48, or its type A or type C companions, provides for the usual transverse load and deformation test data.

In the following case, the distribution of deformation over a 6 in. length of a beam loaded transversely was tested under the observation of Prof. W. L. Collins and his associates at the University of Illinois. The test beam provided a facsimile of an I-beam. It was 26 in. long and 2.80 x 2.80 in. overall with the web and top and bottom flanges 0.500-in. thick. The span range was 26 in. and two loads 6 in. apart were placed symmetrically with respect to the center of the span. Strain gage readings were taken over 4-in. gage length. The properties of the I-beam were compared with a solid rectangular cross section beam measuring 26 in. long x 2.80 x 2.80 in. and tested on a 24 in. span in the same manner.

The results shown in Table I demonstrate the greater stiffness of the I-beam section and the greater strength of the solid beam section, both beams having been made at the same time of a material of the same composition.

Fig. 1 illustrates the beam and beam section. Transverse tests on solid rectangular beams are commonly specified in testing cast iron pipe. In this case, the specimens measure 2 x 1 x 26 in.

Tests of this type may develop useful information on the stiffness and strength of such cast parts as frames for machine tools, hydraulic presses, printing presses, and

Fig. 1—I-beam section, 26 in. long x 2.8 x 2.8 in., used to measure distribution of strain over 6-in. length at midsection of beam

Fig. 2—Compression specimens after testing. Original size of short type ¾ x 2¼ in. Original size of long type ¾ x 4½ in. long

Fig. 3—Ruptured specimens of cast iron. Type—L/d = 6. Bottom—L/d = 3.

Fig. 4—Appearance of notched (left) and unnotched (right) specimens after compression test

(Courtesy University of Illinois)

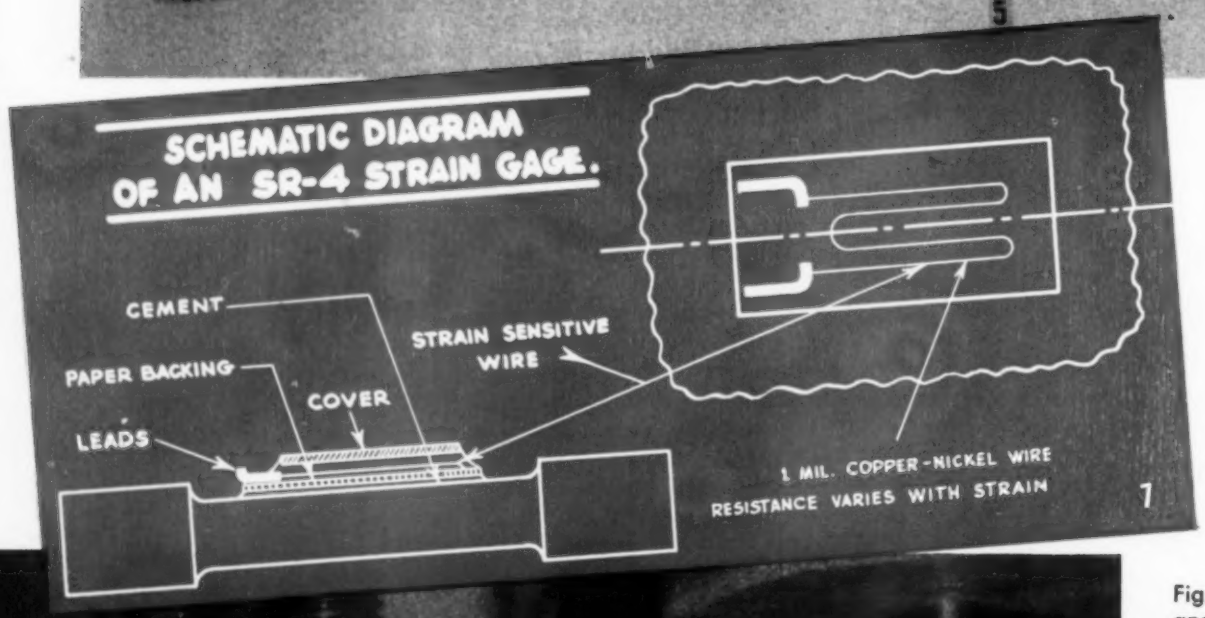


Fig. 7—Strain-resistance gage is cemented to specimen. Stretching of the wire alters the electrical resistance in proportion to the degree of deformation. *(Courtesy University of Illinois)*

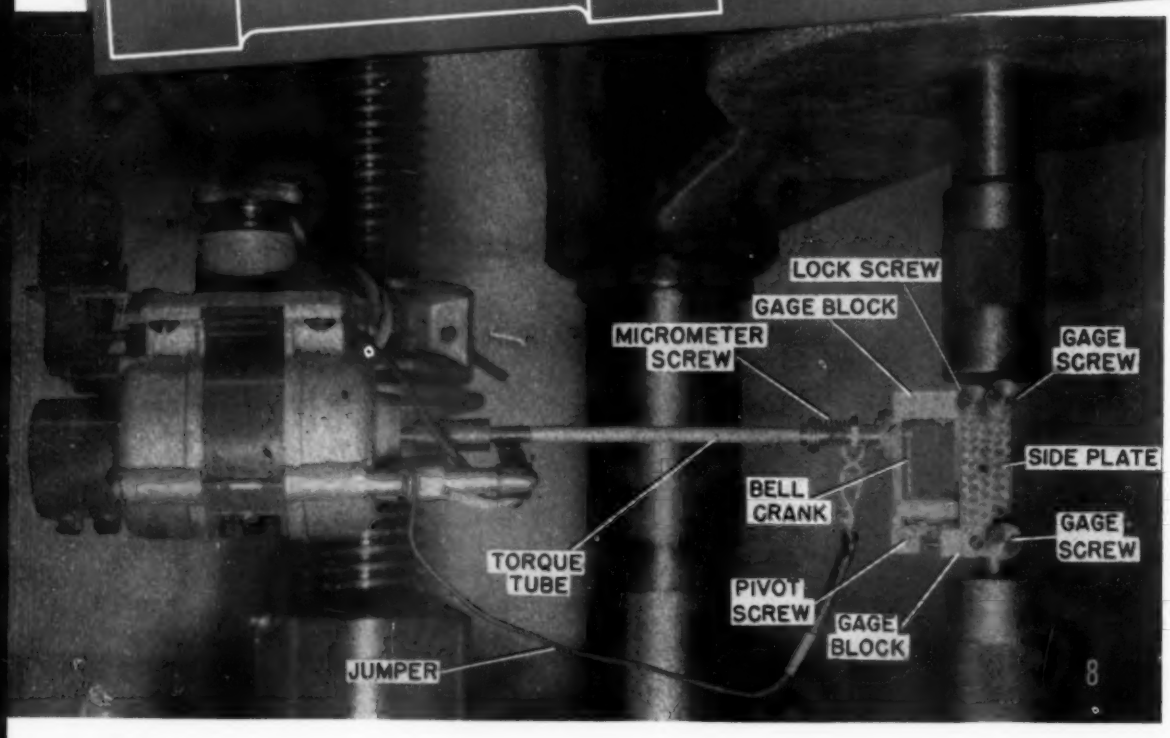


Fig. 8—Illustration of extensometer and motor attachment equipment for registering deformation in tension *(Courtesy O. S. Peters Co., Washington)*

Fig. 5 — Solid and hollow tensile specimens; also threaded on inside and outside ends to determine effects of load. Specimens 12 in. long with 0.800-in. diameter at reduced section. *(Courtesy University of Illinois)*

Fig. 6—Cast iron tensile specimens used for castings or test bars of different cross section. SR-4 gages for precise strain measurement are attached *(Courtesy American Brake Shoe Co.)*

similar machinery composed for the most part of beams and columns.

(b) Compression Tests: Compressive strength of cast iron is important in connection with the application of castings for anvils, dies, casters, pillow blocks, rolls, etc.

The prescribed method for compression testing of cast iron is described in American Society for Testing Materials Specification A256-42T. It requires a short cylindrical specimen 0.798 in. in diam x 2.375 in. long for breaking load measurements, and a long cylinder, 0.798 in. in diam x 6.375 in. long, for determining the modulus of elasticity in compression. This specimen is of sufficient length to permit fastening mechanical strain gages to it for deformation measurements. Figs. 2 and 3 illustrate typical short and long specimens such as are used for compression tests, after testing. Tests upon high strength cast iron of the following composition produced the results shown in Table II for compressive strength and modulus of elasticity.

In some special tests on the compressive strength of notched and unnotched specimens, Collins and Smith[1] used test pieces, 0.500 in. in diameter x 1.5 in. long, for compressive strength tests. They also measured the compressive strength of specimens 0.625 in. in diameter, which were notched with a 60° notch to finish at 0.500 in. in diameter at the reduced section. These notched specimens showed about 10 per cent greater load carrying capacity in compression due to the flow of the metal in the neighborhood of the notch. In the case of specimens of Material *D*, plasticity was sufficient to increase the cross-sectional area materially, and thus increase the load carrying capacity of the short specimen. Table III summarizes the data, and Fig. 4 illustrates the appearance of the crushed specimens.

(c) Tensile Testing: The standard tensile test specimens for cast iron are described in American Society for Testing Materials Specifications A-48 and E-8. Briefly, these tensile specimens are machined from cast bars and tested in the dimensions shown in Table IV.

Modifications of the tensile specimen are occasionally necessary in determining the stretch or elasticity of cast iron under tension, and a description of some of the specimens used for this purpose is contained in the text on "Elasticity and Deformation."

Many variations of the tensile test may be necessary for special investigations or for obtaining approximate values from test pieces cut out of castings. Fig. 6 illustrates some of the tensile specimens employed in the laboratories of the American Brake Shoe Co. A very small tensile specimen is used by the American Hammered Piston Ring Co. in determining the strength of piston ring irons in sections comparable to those of commercial piston ring castings.

Draffin and Collins[2] used the type of specimen shown in Fig. 5 to obtain properties in tension of hollow and solid specimens. The specimens were also tested by applying the load through externally threaded ends, as well as internally threaded ends. The tensile strength per unit of metal cross section was less for the hollow specimens, but within 10 per cent of the solid metal strength. A comparison of results is shown in Table V.

The original work also included measurements of strain over six longitudinal gage lines, each 8 in. long. The elasticity tests in the following text describe additional forms of tensile specimens which are used to obtain both the strength of the material and its deformation under load.

(d) Elasticity and Deformation: Data upon the elasticity and deformability of cast iron under load have always been much sought for, since they offer the designer some measure of the amount of deformation that accompanies the load he plans to apply. In other cases they offer some measure of the toughness of the material. The deflection of the test bar in the transverse test has been occasionally used as a measure of bend ability or toughness, but careful work with high grade equipment is needed to obtain accurate values. Usually "total deflection" is measured and no effort is made to distinguish between elastic and plastic deformation.

More recently, less tedious methods for measuring the stress and deformation in tension of cast iron have led to the development of more information upon plastic and elastic deformation. The new methods employ the fine sensitivity of electrical measuring instruments to achieve the desired result.

Using SR-4—Type 3 resistance strain gages cemented to the sides of the test specimen, Flinn and Chapin[3] measured the plastic and elastic stretch in cast iron specimens. Specimens of the type shown in Fig. 6 were used. The strain gages in these tests consist of a filament or strain-sensitive wire whose electrical resistance changes with deformation in a manner that permits calibration. Fig. 7 illustrates filament gage. The filament in its protective covering is cemented to the surface of the test specimen and its leads attached to a sensitive resistance measuring device. Their results indicate total deformation varying from 0.0012 in. per in. for white cast irons to over 0.030 in. per in. for the tough austenitic cast irons. Plastic deformation may be as low as zero for the white iron and 0.027 in. per in. for the austenitic iron.

The advancement in the application of electrical instruments for measuring the deformation of metals has also led to the Selsyn motor system of recording deforma-

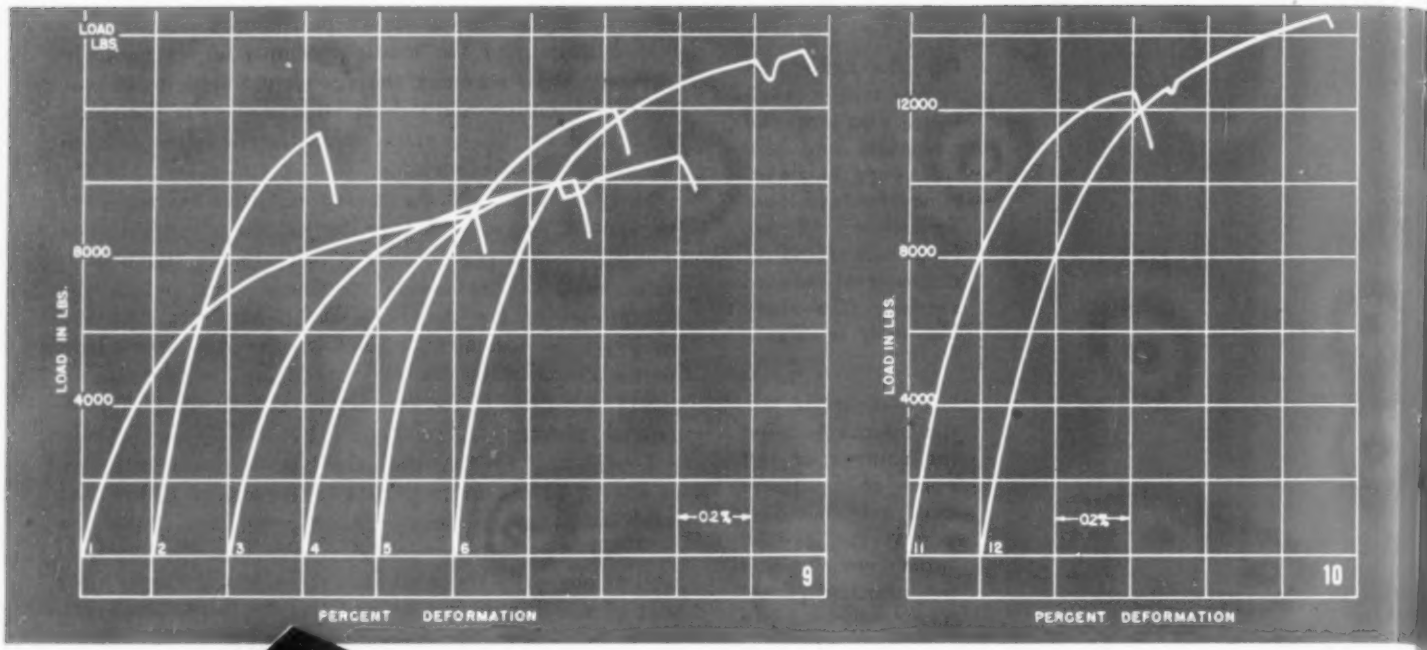


Fig. 9—Typical stress-strain curves for an unalloyed cast iron. Fig. 10—Typical stress-strain curves for a nickel molybdenum cast iron

Fig. 11—Appearance of fractures in solid and hollow torsion test specimens after testing. *(Courtesy University of Illinois)*

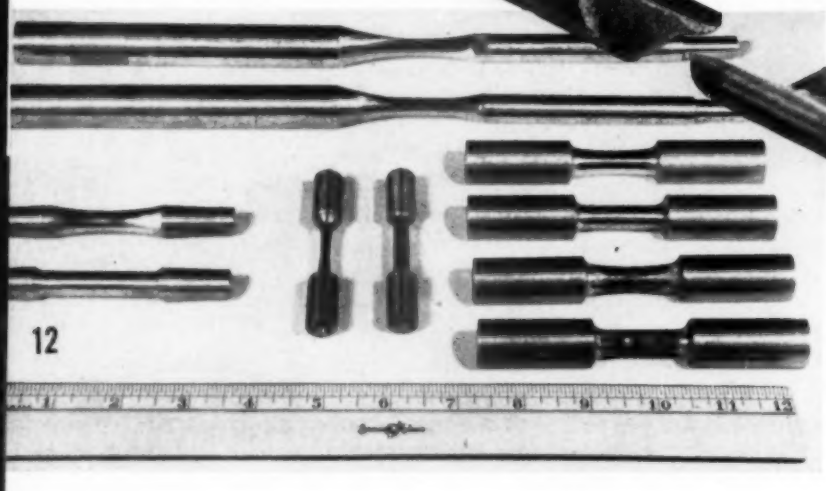


Fig. 12—Notched and smooth specimens used for handling axial and torsional endurance tests at elevated temperatures and in corrosive environments. *(Courtesy University of Illinois)*

tions registered through a special extensometer (Fig. 8). The extensometer itself is designed to come apart without damage to the instrument so that metals may be tested up to their breaking strength. In this device the extensometer multiplies the distortion through a pivot and lever system which at its terminals is fitted with two contacts. In the course of the test it is the function of the motor to maintain contact as the metal is deformed. A second motor synchronized with the first, duplicates its movements and registers the deformation autographically. The simplicity with which these devices can be applied should make the data which they provide much more readily available. Figs. 9 and 10 and Table VI summarize the results typical of tests made by this method.

Since most of the tests on elasticity are made on steel specimens, it is natural that the initial work on cast irons would be made in shapes corresponding to the 0.505-in. diameter of the standard tensile test steel specimen. However, some tests have been made on the 0.798-in. diameter cast iron specimen provided with sufficient gage length to permit an attachment of the extensometer. American Society for Testing Materials standards for specimens of this

TABLE I—Strength and Stiffness of Solid vs I-Beam Sections

	Composition, %							
TC	Si	Mn	P	S	Ni	Mo	Cu	Cr
3.06	1.17	0.87	0.06	0.123	1.20	0.91	0.11	0.08

	Breaking Load, psi	Modulus of Elasticity, psi
Rectangular solid	52,000	20,000,000
I-beam section	37,500	21,000,000

TABLE II—Typical Compression Test Results

Si	Mn	TC	Cu	Cr	Ni	Mo
1.17	0.87	3.06	0.11	0.08	1.20	0.91

Average compression strength, psi (L/d=3) 152,500
Average compression strength, psi (L/d=6) 116,400
Average modulus of elasticity, psi (L/d=6) 20,700,000

L/d=ratio of length to diameter

TABLE III—Compression Tests—Notched and Unnotched Specimens

Mark	Type	Tensile Strength, psi		Compressive Strength, psi	
		Unnotched	Notched	Unnotched	Notched
A	Plain	19,300	21,200	80,000	104,000
B	Ni-Mo alloyed	53,400	51,600	236,000	270,000
C	Inoculated	46,000	43,800	140,000	193,000
D	Ni-Resist	31,600	32,100	182,000	327,000

	Composition								
	TC	Si	Mn	S	P	Ni	Cr	Mo	Cu
A	3.32	1.75	0.51	0.138	0.48	0.04	0.01	0.00	0.05
B	3.11	2.23	0.66	0.104	0.10	1.49	0.09	0.79	0.18
C	2.84	1.52	1.05	0.124	0.07	0.20	0.31	0.00	0.37
D	2.63	2.14	1.23	0.065	0.16	14.90	2.09	0.00	6.94

TABLE IV—Dimensions of ASTM Test Bar Cross-Sections

ASTM Spec.		From ASTM Specification A—48		
		A	B	C
A—48	Size of cast test bar	.875	1.20	2.00
A—48	Diameter (in.) at mid-section machined tensile specimen	.505	.750	1.25

TABLE V—Tensile Strength of Cast Iron in Hollow and Solid Test Bars

Test	TC	Si	Mn	Ni	Mo	P	S	Average Tensile Strength psi	
								Hollow	Solid
A	3.06	1.17	.87	1.20	.91	.06	.12	39,600	45,800
B	3.06	1.17	.87	1.20	.91	.06	.12	47,400	49,900

TABLE VI—Stress-Strain Tests of Cast Irons

Type	Chemical Composition				BHN	Tensile Strength		Elongation	
	TC	Si	Ni	Mo		.798" OD*	.505" OD**	Total	Plastic
Unalloyed	Under 3%	1.3-1.8	.....	.....	238	56770	55,620	0.81	0.58
Ni-Mo	Under 3%	1.3-1.8	Approx. 1%	Approx. .2%	265	61540	68875	0.79	0.53

* .798" OD standard test bar, standard test.
** .505" OD 2" gage length threaded bar, tensile-elongation test

type have not yet been developed, but the greater interest which the new methods provide for obtaining stress-strain data, plus the generally accepted fact that the deformation is greater in specimens of smaller cross section, should lead to a study of this problem, which would result in the establishment of standard specimens.

These tests portend significant developments in the applicability of cast irons to various industrial purposes.

Cast iron structures operating statically, such as the frames and housings for machine parts, and cast iron parts operating dynamically such as gears, cams, cranks, etc., may profit from tests that lead to a better understanding of their capacity for deformation under load.

(e) Torsion Testing: Methods for the torsion testing of cast iron have been outlined in American Society for Testing Materials Specification A-260-42T. In general, the specimens are designed with sufficient length to permit some twisting along the midsection, while the ends are of square section designed to be fitted closely and held firmly during the test.

Some departure from the American Society for Testing Materials standard method of torsion testing has been indulged in to determine the difference in behavior of solid vs hollow specimens. Fig. 11 illustrates specimens of this type after test. The results indicate that the modulus of rupture in torsion varies directly with the tensile strength and results in a value of 1.36 times the tensile strength for the solid cylinder, and .73 times the tensile strength for a hollow cylinder. The further comment is added that the results of tests on 1-in. diameter hollow cylinders are in agreement with those obtained on cylinders 3½ and 4½ in. in diameter.

The foregoing work was done by Draffin, Collins and Casberg[4]. Collins and Smith[5] also investigated the effects of notches and drill holes on torsional fatigue test pieces of the type shown in Fig. 12. As a result of this work, it was found that the modulus of rupture in the static torsion test was practically unchanged at a value of 1½ times the static tensile strength. The "endurance limits in torsion" were correlated with "endurance limits in bending" tests and resulted in comparable values for notched and unnotched specimens. In other words, the endurance limits for smooth specimens tested by repeated torsional or bending stress amounted to approximately 40 per cent of the tensile strength and were weakened by the notches an additional amount so that notched specimens finished at values amounting to about 30 per cent of the tensile strength.

(To be concluded next month)

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Foundry Practice in Argentina

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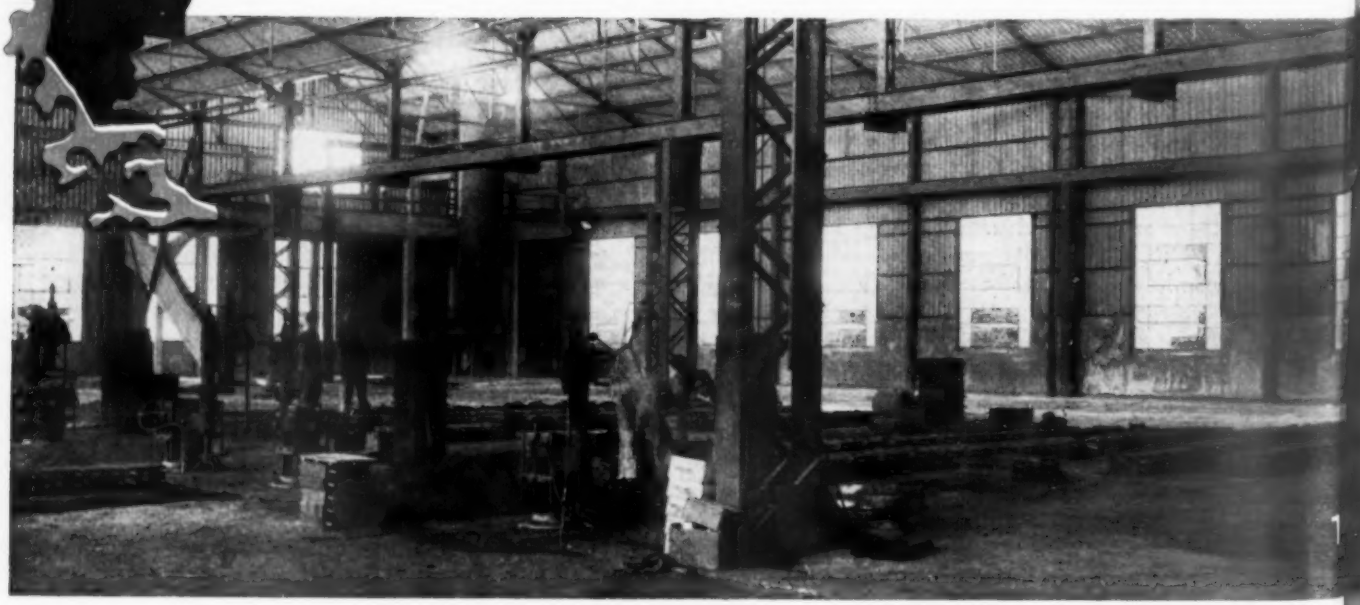
PRINCIPAL products of Argentina are agricultural in nature, and manufacturing industry plays only a minor role. The Argentine economic system has consisted largely in exporting meat, wheat, corn, hides, oils, fats, etc and importing manufactured goods. For balanced trade conditions, she must trade with those countries which will accept her agricultural produce in exchange for their fabricated articles. All automobiles are imported, and roughly 95 per cent are from the United States. All railroad freight cars and passenger coaches have been made in England. The coaches used on one of the five subway lines were made in the United States, but the coaches used on the last three lines constructed are equipped with electrical and mechanical parts made in Germany. The majority of bicycles are made in England. Farm implements are from the United States, Canada and England.

During the war years Argentine imports were curtailed drastically and as a consequence a heavy demand for manufactured goods developed. This demand created a general rise in price of all manufactured goods which served as an incentive to produce some of the articles that were formerly purchased abroad. This was especially true for the foundry industry where the demand for machine and machine parts as well as directly usable products



was first felt. In recent years the purchaser of cast articles was not so much interested in the price of the article as he was in the delivery date. Under such favorable conditions the foundry industry flourished, the only sizable handicap being the difficulty in securing some of the raw materials, principally coke, fuel oil and pig iron.

Argentine historians may well point with pride to the part the foundry industry played in their battle for independence. The great liberator Captain San Martin, a name as hallowed in Argentina, Chile and Peru as the name of George Washington is in the United States, was not only a great military strategist of his day, but also a great foundryman. With only a small army, he paused long enough in the Andes mountains to establish a foundry and with the help of a Spanish priest and native Indians, cast much needed bronze cannon with which he ultimately routed the Spanish invaders. The latter were not only far superior in numbers, but also comprised an army well equipped and highly trained.

Foundry history of Argentina parallels in many respects that of the United States, since the first foundries were under the supervision of men who had acquired their foundry training in European countries. Many of the casting shops in operation today are owned, under the direction of, or have been influenced by men who have worked in European foundries, mostly Spain and Italy. The general foundry practice followed in Argentina today is therefore the foundry art of those respective countries.

Actual number of foundries in operation in Argentina is not known with any degree of accuracy. Before a census could be taken, it would be necessary to define what constitutes a foundry, because there are many ingenious "one-man" foundries operating in basements, garrets and woodsheds, busy casting a variety of objects such as knives, forks, spoons, children's toys, etc.

In the Buenos Aires area it is estimated there are over 500 commercial foundries, both ferrous and nonferrous. Of this number there are about 12 steel and two malleable foundries. Many of these shops are small, employing only a few men, while the larger foundries may employ as many as 500 men. The size of castings made is limited by melting facilities. Recently some publicity was given to the pouring of a gray iron casting weighing 30 tons, reputedly the largest casting made in the Republic to date.

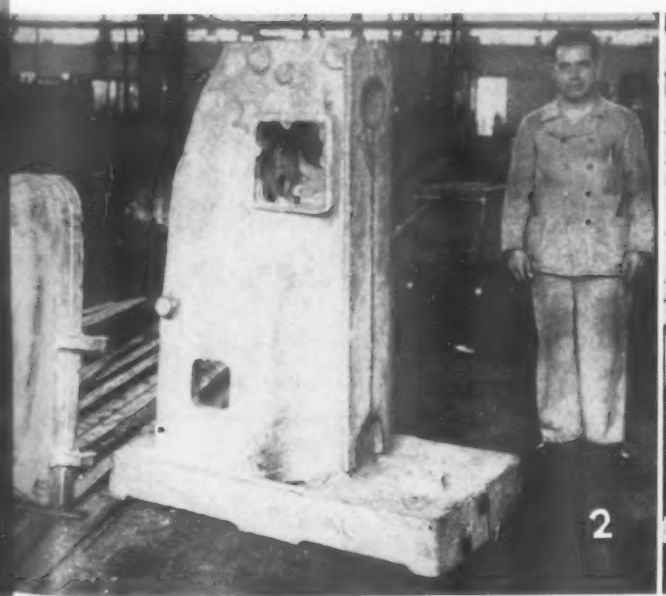
Brief analysis of foundry control indicated that there is almost complete absence of chemical and mechanical specifications. The usual acceptability of a casting is based upon the visual appearance of machined and unmachined surfaces. Transverse and tensile test bars for gray iron are practically never made, and with very few exceptions are steel and nonferrous tensile tests performed. Hardness is used to some extent as a means of judging the fitness of a casting.

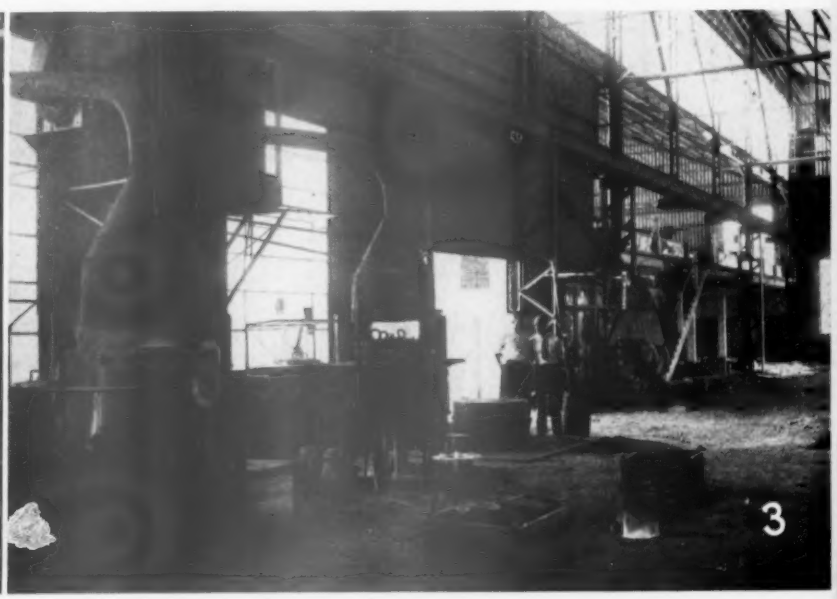
Most of the foundries rightfully may be classified as jobbing shops. Due to low production requirements, very few of the foundries are equipped with molding machines. Much of the molding is done by hand. Since bottom boards generally are not used, the material used for molding sand is rammed very hard in the flasks to prevent dropping out. In many shops the molds for gray iron as well as for nonferrous alloys are oven dried before pouring. This is because of the unsuitability of the molding material being used. The source of most of the molding sand is "tierra colorada," meaning red earth. It is a relatively fine substance running about 20 per cent clay, an average grain fineness (*Please turn to Page* 182)

Fig. 1—Partial view in one of the modern foundries showing the floors devoted to production of light and medium section castings on molding machines. Construction of the foundry is such as to provide good lighting and ventilation

Fig. 2—Gray iron castings are produced in a wide range of sizes and weights. This shows two castings for machine tools

Fig. 3—Section of the foundry devoted to brass molding contains two tilting-type, oil-fired crucible furnaces and a rocking-type, indirect-arc electric furnace. Furnaces are hooded to carry off smoke and fumes generated during melting





Repair Welding of steel

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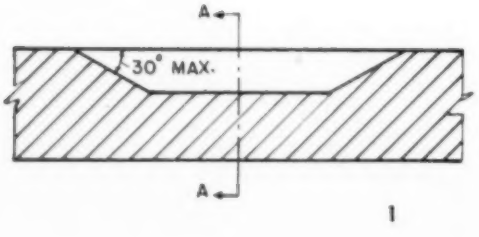
Left—X-ray inspection of steel casting

Figs. 1 and 2—Two types of preparation of castings for repair welding

Fig. 3 — Chart comparing hardness with angle of bend and indicating that ductility is a proper index to weldability

Fig. 4 — Effect of heat treatment on tensile strength of an alloy cast steel (C 0.30 per cent, Ni 1.68 per cent, Cr 0.55 per cent, Mo 0.27 per cent)



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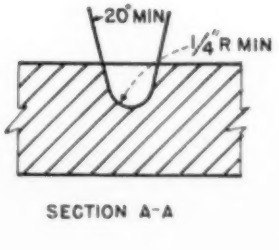

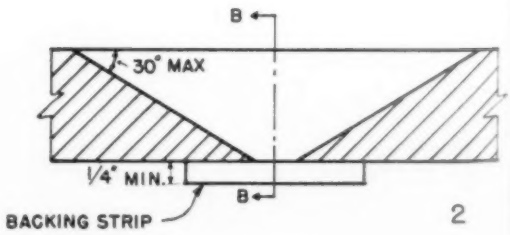

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STEEL castings are keeping pace with modern trends to greater strengths and lighter weights in engineering materials. Strict metallurgical control of melting practices, improved casting methods and heat treatment of the final product are utilized to develop an excellent balance of strengths (yield, ultimate, impact) and ductilities (elongation, reduction of area). Inspection procedures depend upon radiography, magnaflux and other recognized inspection tools. And more attention is being given to repair welding covering both the welding procedure and the welding electrodes. All of these factors

castings

merit particular study because severe conditions of service place a premium on sound, homogeneous castings absolutely free of stress raising flaws.

Modern physical properties are achieved by an increasing use of carbon and manganese together with nickel, chromium, molybdenum, vanadium and other alloys. Suitable heat treatments, as the example in Fig. 4 demonstrates, are selected to reach the mechanical properties desired.

Three phases of casting repair by metallic arc welding are deserving of study:

1. Removal of the defect and preparation for welding.
2. Establishment of welding procedure.
3. Adoption of suitable electrode type.

Because preparation for welding is well understood by foundrymen, only a brief discussion of the high spots will be undertaken. Major emphasis will be directed to welding procedure including weldability and weld metal. Every effort will be made to stay on the solid ground of facts and to avoid the swamps of conjecture.

A casting defect may be any discontinuity in the casting that could conceivably impair the utility of the casting in service. Commonly recognized defects include gas or shrinkage cavities; cold shuts or other included metallics such as chills and chaplets; sand or slag inclusions, and hot tears or cracks.

Inspection procedures to locate defects depend upon visual observation, radiographic examination by gamma or x-rays, and magnetic particle testing. All of these methods are familiar to the foundryman.

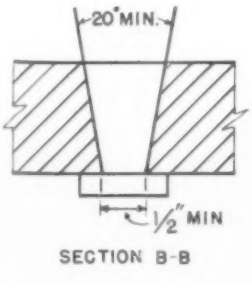
Once the defects are marked by the inspector, several processes are available for removing them. Among these are chipping, grinding, flame gouging, carbon arc cutting, metallic arc cutting and machining. After defects are removed, magnetic particle testing may be used to make sure that all of the defect has been cleaned out. When flame gouging, carbon arc cutting or metallic arc cutting are employed, consideration must be given to the effect of heat on the casting.

The shape of the groove to be filled with weld metal is quite important. Two suggested types of preparation are given in Figs. 1 and 2. One of these, Fig. 1, covers a repair that extends only a part of the way through the casting wall. The other, Fig. 2, covers a repair that necessitates cutting all the way through the casting thickness. Notice the gradual slope provided at each end of the groove. Because the deposition of sound weld metal at the beginning and at the end of a weld bead needs particular attention, the recommended slopes permit the welder to control his starting and stopping techniques. Backing strips are necessary when through welds such as Fig. 2 are being made.

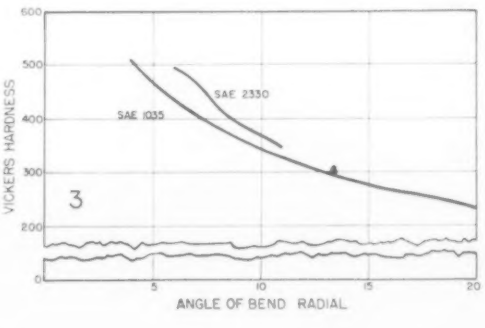
Other than representing the space formerly occupied by the defects, the welding groove plays another role. Proper engineering of the welding groove allows the welder to make a sound weld. He must have enough room in which to manipulate his elctrode to control the slag. The groove should be wide enough for large-diameter electrodes where heat input is necessary to the development of a ductile heat affected zone. Sloping sidewalls make cleaning easier and sloping ends contribute to sound weld metal throughout the full length of the repair.

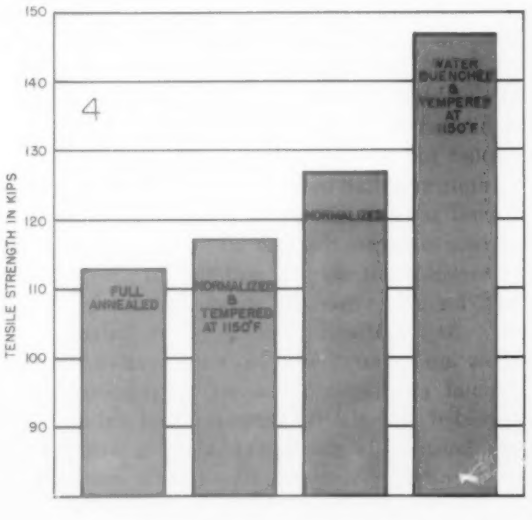
So much for removal of defects and preparation for welding. Now, how should the welding procedure be determined? As considered here, welding procedure and weldability are treated as the same problem.

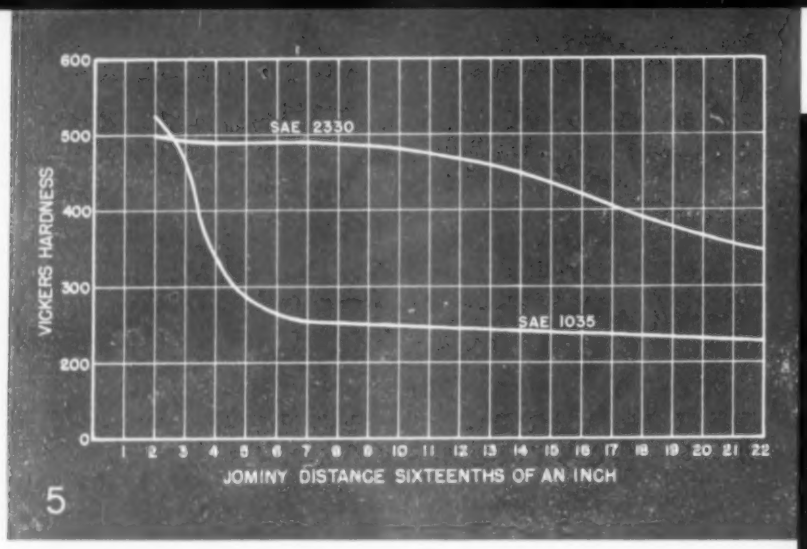
To get down to fundamentals, the functions of a casting repair must be understood. The main objective is to replace an imperfect volume of cast metal with a perfect volume of cast weld metal. If the repair is completed ideally, the entire casting will be one homogeneous unit with identical properties in the weld, in the heat affected zone and in the parent casting. But such a desirable state of affairs cannot be attained. Instead, some compromises are necessary to reach a sound and practical repair in which all of the casting properties are suitable for actual service conditions. Compromises of this nature are not unknown in engineering work, as proved by a widespread use of "factor of safety" to provide insurance for unpre-



SECTION B-B







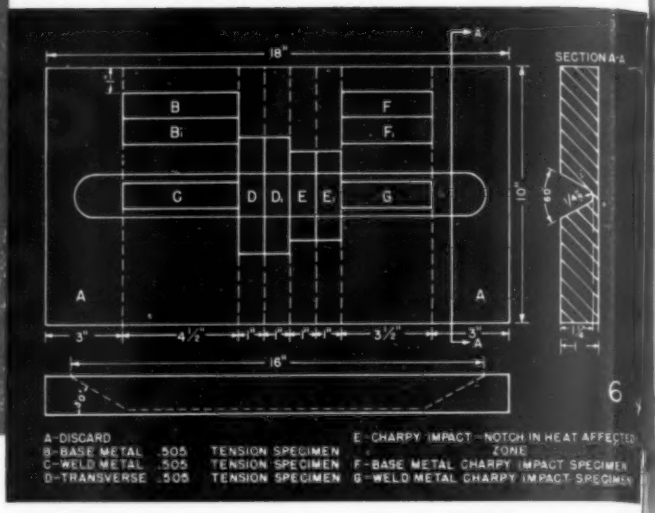


Fig. 5—Hardness compared with Jominy distance. Sharp decrease in hardness of SAE 1035 steel suggests good weldability

Fig. 6—Cast test plate for evaluating physical properties

Fig. 7—Summary of factors influencing hardness of heat-affected zone of SAE 1035 steel

dictable service conditions. Therefore, weldability will be studied to avoid the formation of a brittle heat-affected zone, leaving the question of the weld metal to a later discussion covering the adoption of a suitable electrode type.

Current thinking among welding engineers has focused attention on ductility of the heat-affected zone as a useful criterion of weldability. Formerly, hardness was a popular index. However, at equivalent hardness values low alloy steels generally show greater ductilities than plain carbon steels. This fact is demonstrated in Table I where angle of bend is compared with hardness (Vickers hardness number) at the 200 and 350 vhn levels. Note that lower carbon steels such as NAX, Yoloy, Mayari, NE 8620 appear to have better ductility, as hardness provided by alloys lowers ductility less than carbon hardness. To better visualize Vickers hardness numbers, it may be mentioned that they are roughly equivalent to Brinell hardness, 400 Vickers being 384 Brinell and 350 Vickers being 341 Brinell.

Translation Problems Remain Unsolved

Although the basic problems of translating weldability into specific service requirements remains unsolved, the last six years have brought us a much better understanding of the subject. Involved in the problem are the chemistry of the steel; mechanical properties of the steel after welding; the mechanical properties of the joint itself; hardness and ductility of the joint; and tendency of the parent metal to crack in the heat-affected zone of a restrained weld. Because the Lehigh ductility test included in a *Guide to Weldability of Steels* issued by the American Welding Society offers a good method of coming to grips with weldability factors, welding procedure may well be established with this system. That assumption will be adopted for this analysis.

Admitting that there is no precise translation of heat-affected zone ductilities into good service applications, experience suggests that the 20° bend ductility agreed upon for as-welded structures and the 10° bend angle put forward for stress-relieved structures should prove satisfactory. As a matter of fact, there are indications that these values are, if anything, too conservative. Because of his personal experiences, the writer proposes that the 12° as-welded and the 6° stress-relieved values suggested for very hardenable steels welded with austenitc electrodes be extended to include lime-ferritic electrodes. An explanation of this position will be given when electrode choices are considered.

An attractive feature of the Lehigh system is found in the universality of its application. By carrying out the simple tests required, the weldability of any steel can be evaluated. No longer must the foundry metallurgist be confused by suggestions of preheating to 200 F, 300 F or 400 F for the same steels. Now he can evaluate welding temperatures instead of wondering what is meant in the literature by typical comments anent preheating such as "preheating is desirable"; "no welding to be performed below 70 F or 32 F"; "preheat thick sections"; or other well meaning but indefinite instructions.

Many welding specifications attempt to limit the temperature of the casting to a minimum of either 70 F or 32 F. There appears to be little justification for the former limitation although the latter may have merit in some work. Tables VII and XII demonstrate the minor role played by base metal temperatures when the whole matter of welding procedure is analyzed.

Placing artificial limits on the lowest temperature at which castings can be repaired probably represents a crude attempt to control welding methods. Much better would be some statement as to the generic type of electrode to be selected, as to electrode size, as to welding speed, etc. But a complete recipe for satisfactory repair welding would be difficult to devise and well nigh impossible to administer by any specification writing body.

A more reasonable approach to the problem is to make a general statement suggesting that repair welding be done with full consideration of weld metal properties and metallurgical factors encountered in heat affected zones. In the last analysis foundry metallurgists appreciate the importance of good welding procedure and are jealous of the reputations of their companies. Therefore the regulating bodies might find their work easier and both quality and costs of castings within (*Please turn to page 202*)

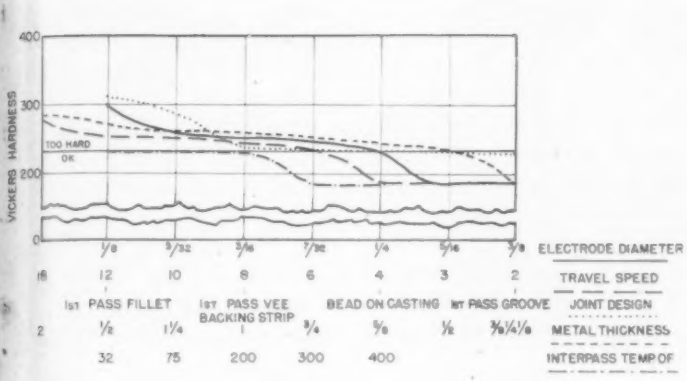


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TABLE I—Ductilities of Carbon and Low Alloy Steels at Specific Hardness Levels

Steel	Angle of Bend	VHN
SAE 1010	23	200
SAE 1020	26	200
SAE 1035	24	200
NAX	30	200
Yoloy	29	200
Mayari	30	200
SAE 1035	9.5	350
SAE 2330	10.5	350
SAE 3135	9.5	350
SAE 6145	7.0	350
NE 8620	14.5	350

TABLE II—Analyses of Steels for Establishing Welding Procedures

Steel	C	Mn	P	S	Si	Ni
SAE 1035	0.37	0.68	0.012	0.034		
SAE 2330	0.32	0.70	0.017	0.024	0.21	3.46

TABLE III—Influence of Welding Current

Steel	Temp. °F.	Electrode Diameter	Amperes	Volts	Travel Speed in./min.	Hardness VHN	Remarks
1035	75	3/16"	225	35	6	245	Too hard
1035	75	1/4"	350	35	6	232	OK
2330	75	3/16"	225	35	6	475	(1)
2330	75	1/4"	350	35	6	365	OK

(1) Heat-affected zone is O.K. with lime-ferritic electrodes only.

TABLE IV—Influence of Arc Voltage

Steel	Temp. °F.	Electrode Diameter	Amperes	Volts	Travel Speed in./min.	Hardness VHN	Remarks
1035	75	1/4"	350	28	6	240	Too hard
1035	75	1/4"	350	35	6	232	OK
2330	75	1/4"	350	28	6	447	(1)
2330	75	1/4"	350	35	6	365	OK

(1) Heat-affected zone is O.K. with lime-ferritic electrodes only.

TABLE V—Effect of Travel Speed

Steel	Temp. °F.	Electrode Diameter	Amperes	Volts	Travel Speed in./min.	Hardness VHN	Remarks
1035	75	1/4"	350	35	12	252	Too hard
1035	75	1/4"	350	35	6	232	OK
2330	75	1/4"	350	35	12	484	(1)
2330	75	1/4"	350	35	6	365	OK

(1) Heat-affected zone is O.K. with lime-ferritic electrodes only.

TABLE VI—Role of Mass

Steel	Thickness	Temp. °F.	Electrode Diameter	Amperes	Volts	Travel Speed in./min.	Hardness VHN	Remarks
1035	2"	75	1/4"	350	35	6	285	Too hard
1035	1/2"	75	1/4"	350	35	6	232	OK
2330	2"	75	1/4"	350	35	6	490	(1)
2330	1/2"	75	1/4"	350	35	6	365	OK

(1) Heat-affected zone is O.K. with lime-ferritic electrodes only.

TABLE VII—Influence of Plate Temperature

Steel	Temp. °F.	Electrode Diameter	Amperes	Volts	Travel Speed in./min.	Hardness VHN	Remarks
1035	32	1/4"	350	35	6	235	OK
1035	75	1/4"	350	35	6	232	OK
1035	400	1/4"	350	35	6	181	OK
2330	32	1/4"	350	35	6	390	OK
2330	75	1/4"	350	35	6	365	OK
2330	400	1/4"	350	35	6	256	OK

Getting and Keeping FOUNDRY WORKERS

The author makes a number of practical suggestions for solving some of today's difficult labor problems. This paper was presented before the 18th annual meeting of the Gray Iron Founders' Society, Oct. 22-23, at Cincinnati

By FRANK O'MALLEY
Personnel Director
Ferro Machine & Foundry Co.
Cleveland

DURING the war we adopted many devices, most of them very expensive, in seeking new employees. We put in downtown employment offices. We went heavily into radio. We paid bonuses to our employees to bring in men, and our advertising bill for help looked like the national debt. We recruited extensively in the South and, as a last measure, we brought in several hundred employes from Jamaica.

Now, obviously, with the war past, a lot of these measures have gone by the board. Today we are relying almost entirely on newspaper advertising. But we have tried to use advertising which is different than the average help-wanted copy one sees in the classified columns. We have tried to tell a little story in our ads. We have tried to make the readers feel that Ferro Machine is a place of stable employment, of good pay and good working conditions, without blatantly saying so in just so many words.

It has been our opinion that this type of advertising has brought results. Considering the times, we have had an entirely acceptable number of people applying, although the quality has been by no means of the highest and we still are not getting all the help we need or are we keeping as many as we would like to keep.

We have also followed other promotional methods. We are giving out match books indicating our need for help. We have written the business people, the ministers and the teachers in our community, telling them of our requirements. We have also attempted, by word of mouth and through a program which we have been carrying on, to let people know that Ferro is a good place to work.

All of these measures have helped us get people. As a matter of fact, today our employment is the highest in the company's history. What we need now is better help. But how are we going to get better help and how are we going to keep it when we get it?

Of course, when you're really desperate you take almost any man who has two legs, two eyes and two arms, and you put him to work. You don't inquire too closely what his previous work record might have been or whether or not he's the type of man who fits into your particular operation.

We don't believe in that. We would rather hire fewer people by screening out the obviously objectionable at the gate. It costs us money even to interview a man. It costs us a lot more money to put him on a job, and we don't believe in wasting this money. So what do we do?

First, we conduct what is really an intelligent employment interview. We find out about the man, about his skill, his experience, his background. We are one of the few companies I know of in our area to check back with the man's previous employers. We want to find out for ourselves why he quit or why he got fired. The fact that a man has been fired by a previous employer doesn't mean necessarily that he is not a good man for us. He may have been a good man for his previous employer, but we do check up carefully before we give an applicant encouragement.

In our work a physical examination is, in my mind, a necessity. Almost a year ago, therefore, we installed a complete x-ray and medical department. As a result, after a man has passed the first hurdles in the interview and we have found that his work record has been satisfactory, we give him a thorough going over. He is x-rayed to see whether there is any indication of silicosis or tuberculosis because every man hired who has a tendency in that direction becomes a distinct liability.

Our x-ray equipment and physical setup cost us about $20,000 and is costing over $10,000 a year to operate. That looks like a lot of money, but considering that it enabled us to weed out about fifty tuberculars and about a dozen silicotics whom otherwise we would have hired with resultant troubles due to poor worker health, (*Please turn to page* 196)

The author discusses the benefits to be derived from co-operative effort in industry, with special reference to patternmakers. This paper was presented before a recent meeting of the Patternmaking Division, Northeastern Ohio Chapter of the American Foundrymen's Association

The Pattern Shop and our National Economy

By ARTHUR J. TUSCANY
Executive Director
Foundry Supply Manufacturers Association

SINCE experience has indicated that the soundest and most satisfactory results in any program of industry co-operation are best realized through the industry's members working closely together in what has been known for some years as a trade association, let us consider the development of association effort.

Any well founded association establishes a definite program and operates according to certain principles. The principles which are usually developed to guide a trade association in its work are not new principles in organized effort. As soon as business began, trade associations were operating under the same principles which apply in industry today, and who is to say when business began among men?

We know that in the Roman Empire there were organizations similar to the trade associations now active in this country. The individual trade association at that time was known as a "collegium," and when the Romans went over into Great Britain, they took their collegia or trade associations with them. From these earlier organizations were developed the guilds of Medieval Europe. There were merchants' guilds, craft guilds and other forms of guilds. And, doubtless, from the guild idea, the trade association has developed in this country, carrying on the very old conviction among men that progress and profit will result in business through organized effort.

One of Aesop's stories illustrates very well what business men are seeking to accomplish through organized effort. This story tells of the dying father who called his seven sons together and asked that each bring with him a stick of a certain length. And the dying father took these seven sticks, bound them together and showed the seven sons how difficult it was to break the bundle when it was bound together. Then he separated the bundle and showed how easy it was to break each individual stick.

And so it is with us in the work which we are doing in our trade associations. We must make the word "co-operation" effective in binding ourselves together so strongly that we cannot be broken apart in accomplishing these things which we know our industry needs to bring about better business.

I am firmly convinced that co-operative effort has come to stay in this country. The place of the trade association and the work which it fulfills cannot be handled as satisfactorily through any other channel.

Industry problems which face any given industry today are, in many instances, the self-same problems which confronted other industries in the past. There is nothing new in any crisis which might be facing our industry. Other groups have been compelled to solve these very problems —or disintegrate.

Each one of them found the answer in the advantages of intelligent co-operative effort—in doing a more constructive selling job on the part of the entire industry, in the recognition of certain outstanding needs, and in the determination to conquer these needs through joint co-operation under the auspices of a well directed trade association.

The lesson is clear. It is possible to stimulate demand by making known the desirable features in a product or type of construction. It is possible to counteract successfully the factors which threaten the prosperity of an industry. It is possible to regain a position of national leadership through unified action.

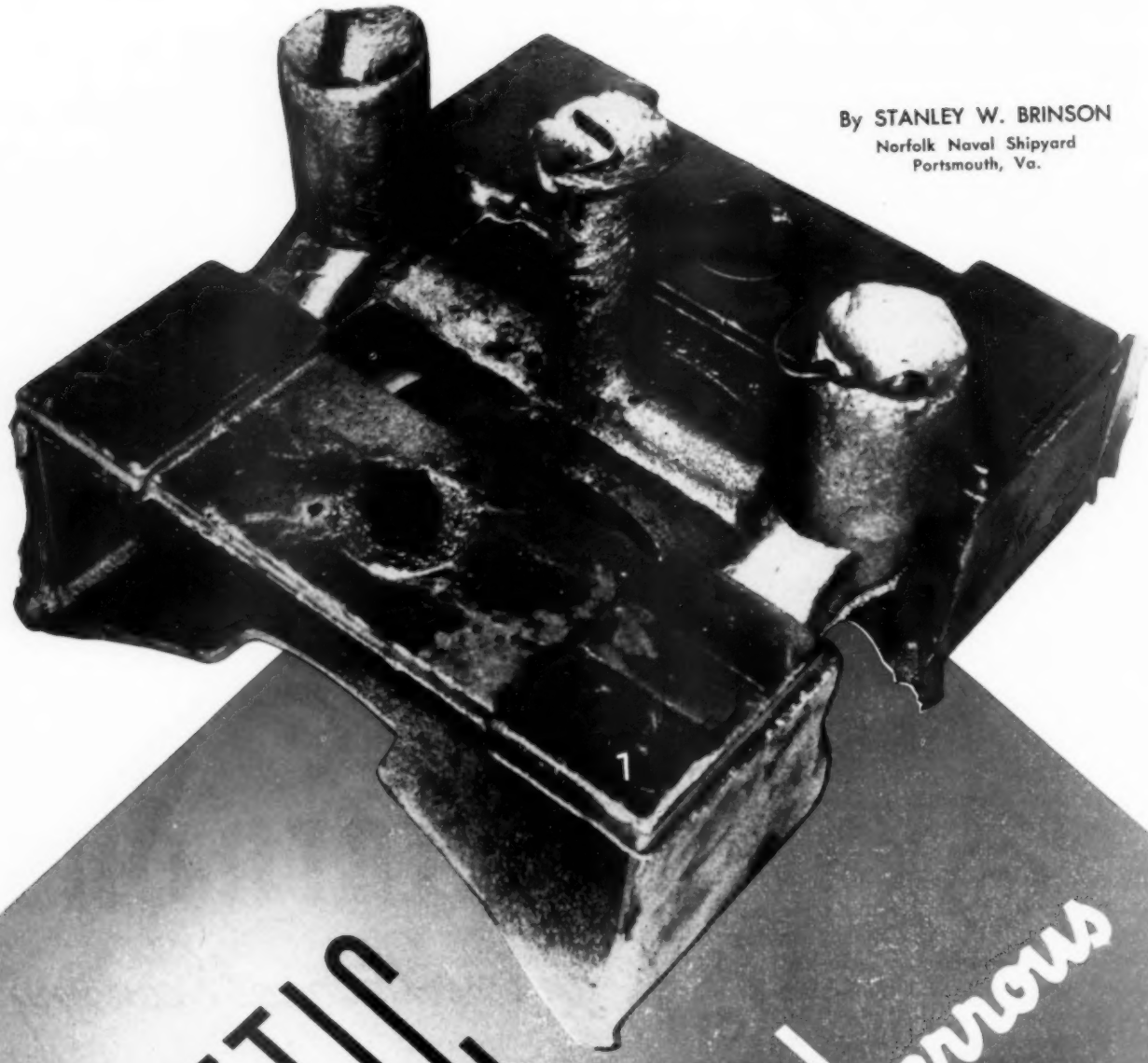
In the nation-wide struggle for markets the efforts of the strongest individual concern are powerless. Only through complete co-operation can an industry make its bid for the buyer's dollar.

Yet, today the buyer is king. Whoever wins him wins the game; whoever loses him is lost indeed.

Other industries have lost no time in adjusting themselves to the new situation. In every case the answer and, I may add, the only possible answer that could ever have been found, was in nationwide co-operation. The story of what American industries have done through co-operative action is one of the most fascinating and intriguing, as well as most brilliant, pages in the industrial history of our country.

We are witnessing today an entirely different type of competition than was prevalent some years back. The individual is no longer competing with his individual competitor; rather, he is competing with other industries seeking to replace his markets with their materials.

We are witnessing today the (*Please turn to page* 216)



SYNTHETIC SAND in the Nonferrous Foundry

By STANLEY W. BRINSON
Norfolk Naval Shipyard
Portsmouth, Va.

This discussion of sand practice employed by the nonferrous foundry of the Norfolk Naval Shipyard, Portsmouth, Va., was presented by the author before the recent Regional Foundrymen's Conference in Philadelphia

THE NAME "synthetic sand" is applied to sands which are compounded in the foundry from selected ingredients to do best a specific job. Adoption of synthetic sand by our foundry in lieu of natural bonded sand for nonferrous use came about naturally for the following reasons:

1. Prohibitive transportation cost of natural bonded sands. Out of the vast amount of bonded sand in this country, the only usable materials are those where, by happy chance, the glaciers deposited a combination of sand grains and clay which included a minimum of fluxes, organic matter and other undesirable materials. These deposits are few in number and too distant from our foundry.

2. Nonuniformity of natural bonded sands with respect to clay content and distribution, grain size and chemical composition.

3. Prior success attained with synthetic sands in iron and steel molding.

Having adopted and used synthetic sand in the nonferrous foundry for several years, we will now proceed to a discussion of the ways and means which are employed in maintaining its high quality, hence its continued satisfactory performance. Treatment of the subject falls under four headings: (1) purchase inspection and tests, (2) nonferrous sand mixes, (3) nonferrous cores, (4) mold washes.

Purchase Inspection and Tests—A full synthetic sand program, to be successful, must employ mixing ingredients of the highest quality. The raw materials which are required to make a synthetic sand mix for a nonferrous foundry are: high grade silica base sand, high grade clay to mix with it and nearly always a small quantity of high grade organic binder.

The term "high grade" is used advisedly. It connotes a definite numerical value of quality for a given unit of quantity. This must necessarily be so if we are to consistently procure materials of the highest quality. Laboratory tests for acceptance of the three foregoing constituents are given below. It is our belief that these tests are sufficiently discriminatory to insure the selection of materials which will best do a specific job.

The first and basic material needed is sand. Acceptance tests for new shipments of sand comprise the following: AFA grain fineness number; plot of the cumulative curve for grain fineness; grain shape determination; microscopic cleanliness examination.

The Norfolk Naval Shipyard Foundry's specification requirements for nonferrous sands read: Silica sand, washed and graded, 55-70, or 90-100, or 140-160 AFA grain fineness number, round grain, 0.5 per cent maximum clay.

Our specifications for bentonite clay are simply: Clay, western bentonite, for use in making molding sand mixes. Bidders are required to submit with their bid a 5-lb sample of the clay they propose to furnish; award is based on the basis of suitability and cost, i.e., award is made to the bidder selling at lowest price per 1000 units merit factor. Merit factor = Sum of green and air dried physicals multiplied by third ram flowability divided by gas evolution.

For those interested in the calculation of merit factor, an outline of tests in connection with it follows.

Physical Property Tests: (a) Prepare standard mix as follows:

60 sand (oven dry)	:	10 lb	(100% sand base)
Western bentonite	:	180 g	(4% of base)
M & H binder	:	34 g	(0.75% of base)
Water	:	155 cc	(3.4% of base)

Mull 1 min dry; add 155 cc water. Mull 3 min; scrape down muller.

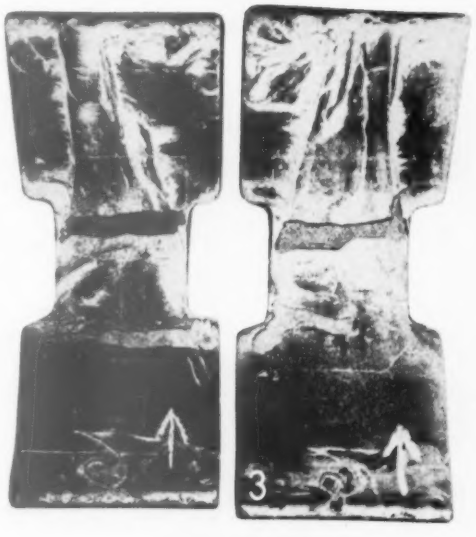


Fig. 1—Cast aluminum bomb chock made in 150 grain size green facing sand. These castings showed buckling, which also appears in Fig. 3 and in the 16-in. aluminum airport cover shown in Fig. 4. These defects were eliminated by use of a specially developed anti-buckle mix

Fig. 2—Cast bushing molded in 150 green facing sand

Mull 1 min; test for moisture. Adjust to 3.4 per cent ± 0.1 and mull 2 min. Seal sand in air-tight container.

(b) Make physical tests for green permeability, green compression, green shear and tensile strength. Test each specimen as it is made to prevent excessive drying of same. Results to be average of three specimens.

(c) Air dry a set of specimens 24 hr. Test for permeability, compression, shear and tensile.

Flowability Test: (a) Prepare three specimens 2 in. diam x 4 in. for flowability. Use instrument of local design (Fig. 12) for this test. Determine flowability after first ram, second ram, and third ram on each specimen. Read scale on inside of barrel after each ram.

Gas Evolution: (a) Use 5 g sample of bentonite. Determine amount of gas evolved after 2 min at 2000 F.

Cereal binders are likewise tested in a manner similar to bentonite clays. Again award is given to the bidder selling at lowest price per 1000 units merit factor. In this case merit factor is determined using the following formula:

$$MF = \frac{(GC + GTS)\ GP + DP + DC}{\text{Gas Evolution} + \text{Hot Strength}},$$

where MF: Merit Factor. GC: Green Compression. GTS: Green Tensile Strength. GP: Green Permeability. DP: Dry Permeability. DC: Dry Compression. Gas Evolution: Gas evolved, in cc, after 1 min at 2000 F.

The specific steps in testing required to obtain these data are as follows.

Physical Property Tests: (a) Prepare standard mixes of the following composition. Reserve enough base sand to make as many 15-lb mixes as there are samples of binder.

15.0 lb	60 AFA sand, dry ..	(100% base sand)
0.053 lb	Cereal binder	(0.36% of base)
0.203 lb	Linseed oil	(1.36% of base)
1.00 lb	Water	(6.7% of base)

Mull sand and binder 3 min. Add oil, mull 4 min. Add water, mull 3 min. Determine moisture with moisture teller.

(b) Test mix for green permeability, compression, shear and tensile.

(c) Bake in oven 1½ hours at 450 F. Determine dry permeability and compression.

(d) Using broken fragments taken from center of above specimens determine rate of gas evolution in gas determinator on two 3-g samples.

(e) Prepare two specimens for dilatometer and determine hot strength at 2000 F.

Nonferrous Sand Mixes — Synthetic sand mixes are used as a facing ½ to 1½-in. thick. This facing is subsequently reclaimed and then used as a filler for backing up the facing. As backing up sand it has an average life cycle of 30 molds, i.e., 30 trips through the reclaiming system.

At the time of adoption of synthetic sand for nonferrous use, one all-purpose mixture—as originally recommended by the Naval Research Laboratory—was universally used. Practical experience with this all-purpose mixture has compelled us to abandon it in favor of several mixes (two regular and five special) specifically tailored to fit the chemistry and physical characteristics of the

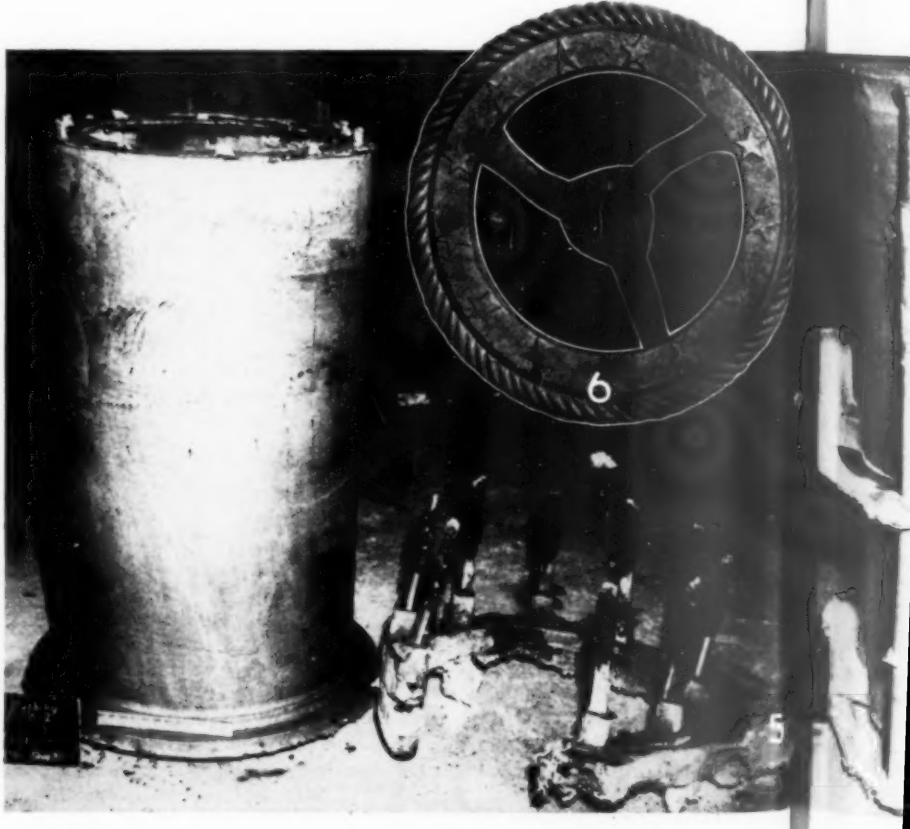


Fig. 5 — Cast upper bushing weighing 4500 lb. Oil facing sand used outside, gravel sand used on inside

Fig. 6 — Castings such as this, where sharpness of detail is desired, are made in plaque mix

Fig. 7—Monel cylinder liner made in oil facing sand

Fig. 8—Drop bolt nuts molded in 100 green facing sand

Fig. 9—This disk was molded in 100 green facing sand

Fig. 10—Mold for this bell employed oil facing sand outside, gravel sand inside

metals we make. The composition, physical properties and uses of these mixes are given in Tables I, II and IV.

The all-purpose sand mix is deficient in several respects, namely:

1. Dextrine contents in excess of 0.5 per cent tend to ball up the sand, thereby reducing both its rammability and flowability as is shown in Fig. 13. Machine molding is difficult if not entirely impossible.

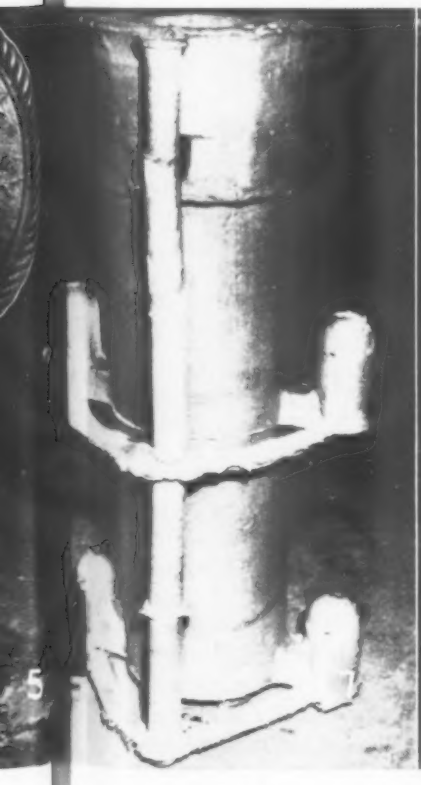
2. The low green physical properties of the mix prohibit its use on castings weighing over 250 lb. They restrict sharply the depth of pattern draw; cause the sand to tear at sharp deep edges; hamper fast production because of frequent patching, nailing and jaggering.

3. The mix is too coarse to procure the requisite degree of finish called for on aluminum diesel castings. It is unsuited for use on the penetrating types of bronzes (phosphor, high tin, high lead) and silicon monel metals without the use of heavy wash coatings.

In connection with the mixes tabulated in Table II, the following observations are made on their limitations, uses and conditions leading to their adoption:

Consider the two mixes 100 and 150. Taken together they account for approximately 75 per cent of the sand consumed on the nonferrous floor. They are used almost exclusively in molding the general run of small and medium sizes of marine, nonferrous castings, representative types of which are pictured in Figs. 2, 8 and 9. The only differences between the two mixes are the base sand grain size and the slightly higher moisture content of the finer mix.

Both have a tendency to dry rapidly, almost in direct proportion to the fineness of the grain. This annoyance, however, does not constitute a serious handicap, for it can easily be overcome by using damp burlap coverings over the tops of filler boxes and openings of shovel out



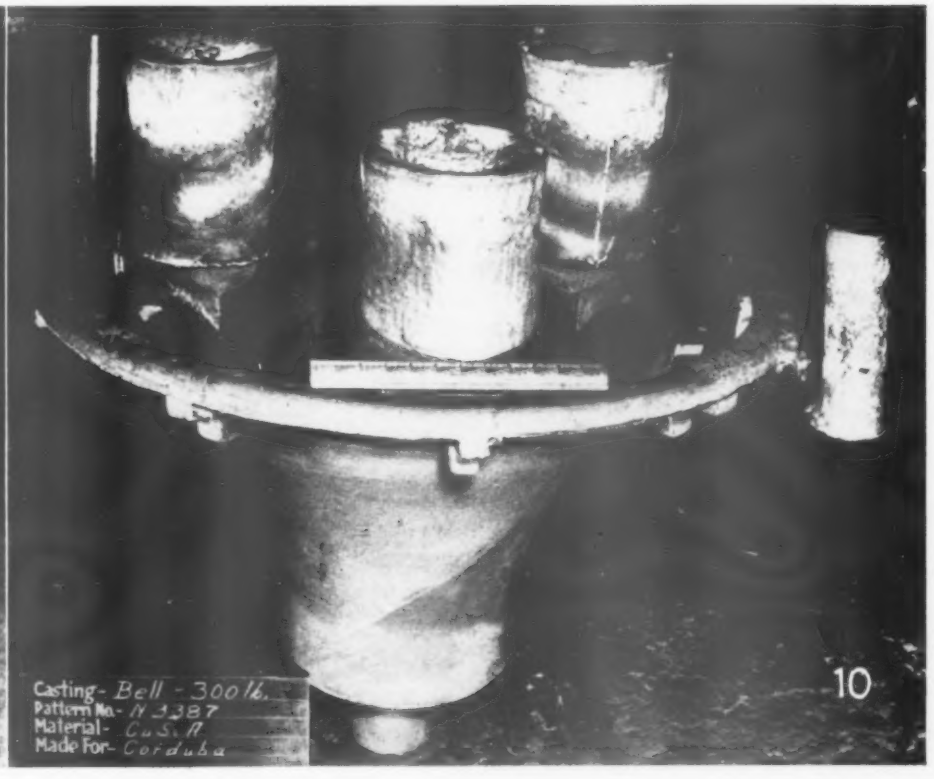


Fig. 11—Chill depth as obtained with steel, 100 sand, carbon blocks, core sand, silicon carbide and zircon sand

Fig. 12—Sand flowability tester. Two AFA standard test specimens (2-in. diam x 2 in.) are used simultaneously. Cylinder graduations are in 1/16-in.

Fig. 13—Graph showing the influence of dextrine on flowability of sand

hoppers. Additions of dextrine, kerosene, ethylene glycol and other supposedly effective anti-driers do not even approach the effectiveness of the simple damp burlap cover in overcoming moisture evaporation.

Recourse to the use of cement mixes, listed fourth in Table II, is availed of only in instances involving the molding of intricately designed pressure bronzes which are liable to leak when made in the standard 100 and 150 mixes. The cement mix has seldom failed to yield a tight casting when all other sand media did. The magic power of the mix lies in its low content of gas-forming materials. It contains no gas-forming substances other than water which, after a 72-hour air-drying period is reduced to less than 1 per cent. Despite its low moisture content, cement sand chills the metal more so than the regular 100 and 150 green sand mixes, thereby imparting to castings denser, deeper skins. The resulting effect of the two factors is one which tends to produce sound castings. Were it not for the tie-up of valuable space incident to the air-drying of cement molds, this mixture would enjoy wider use.

The fifth mix in Table II is gravel sand, a semi-synthetic sand mix. Wholly synthesized gravel mixes have been tried but have not as yet been adopted as standard. This mixture is designed entirely and intended for large bronze castings. In the majority of applications it is used conjunctively with oil facing mix, the latter being very often used to form the outside surface of large castings, while the former is used to form their inside surface.

Bells, condenser water chests and return heads, propeller shaft bearing shells, and monel propellers are examples of dual sand molding. In molding large size molds, it has been found that almost flawless surfaces are obtained when these two mixes are used separately in the same mold — one in the drag, for example, and the other in the cope, or vice versa—whereas minor veins and depressions resembling cracks are liable to occur when one sand is used exclusively for the entire mold. See Figs. 5 and 10 for castings made in molds where one sand is used as a supplement of the other. Incidentally, both mixes are surface washed with a blacking and dried in a mold oven preliminary to assembling and pouring.

Oil facing sand, like gravel sand, is intended primarily for large castings. Having a higher sintering point than the gravel mix, it is better suited for higher melting point metals, i.e., monel, cast iron, corrosion resisting alloys, steels. No nailing is done when using this sand. Abundant experience with synthetic facings prompts us to state that the oil facing mix is one of the best of its kind. The liner of Fig. 7 exemplifies the quality of surface obtainable in this sand.

The fine texture of the plaque mix is employed for molding plaques, bronze tablets, name plates, and architectural tracery where maximum sharpness of outline as well as faithful rendition of detail are desired. Its use is limited to small and medium size castings such as are shown in Fig. 6.

Mix No. 8, the anti-buckle mix, was designed specifically to eliminate scabbing and buckling of aluminum chocks, and covers (Figs. 1, 3, 4). No matter what remedy was resorted to, this buckle occurred with a regularity and a persistence that was most baffling to us. A long list of variables were isolated for study; among them were gate changes, ramming (hand, pneumatic, jolt, squeeze, slinger) different (*Please turn to page* 233)

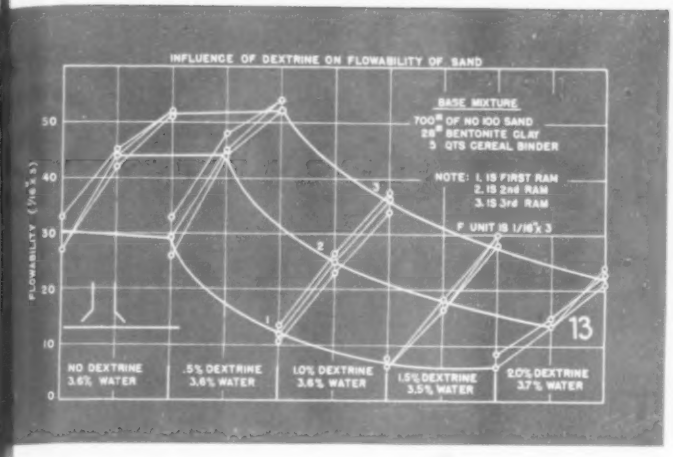


TABLE I—Synthetic Facing Sands for Molding Nonferrous Metals

	Condition	Permeability	Physical Properties, Minimum Requirements Psi Comp.	Psi Shear	Psi Tensile
Universal	Green	80	4.0	...	...
100, Reg.	Green	50	4.0	1.0	6.0
150, Reg.	Green	25	4.0	1.0	5.0
Cement, Spec.	Green	60	1.0	.5	5.0
	Air-dried	50	80.0	20.0	10.0
Gravel, Spec.	Green	60	9.0	2.8	14.0
	Dry	100	190.0	30.0	24.0
Oil Facing, Spec.	Green	15	6.5	1.8	8.0
	Dry	30	280.0	110.0	120.0
Plaque, Spec.	Green	12	5.0	1.5	6.0
Anti-Buckle, Spec.	Green	25	4.0	1.0	6.0
Silicon Carbide	Green		...	...	...
Reclaimed Heap	Green	80	3.8	1.2	6.0

TABLE II—Composition of Synthetic Facing Sand Mixes for Molding Nonferrous Metals

Mix Designation	Base Sand: Kind	% by Wgt.	Grain Size	Additions, % of Base, by Weight: Bentonite	Binder	Dextrine	Wood Flour	Cement	Rosin	Moisture	Oil
Universal	Silica	100	70	3.0	.75	1.5				3.5-3.8	
100, Regular	Silica	100	100	4.0	.63					3.6-3.9	
150, Regular	Silica	100	150	4.0	.63					3.9-4.2	
Cement, Spec.	Silica	100	60					11.0		5-6	
Gravel, Spec	Gravel	50	20	1.6	.37				.6	6-7	
	Heap, Steel	25	70								
	Lumberton	25	95								
Oil Facing, Spec.	Silica	75	60	2.0						6.7-7	
	Silica	25	200—								1.0
Plaque, Spec.	Albany, Old	50	200	1.0	3.00					6-7	
	Albany, New	50	200								
Anti-Buckle, Spec.	Silica	67	150		.63		1.8			3.9-4.1	
	Silica	33	60	4.0							
Silican Carbide	SiC	100	60	4.0	.50	1.3*				4.5	
Reclaimed Heap	Silica	100	100	.5						3.0-3.3	

Notes: Grain size: A.F.A. grain fineness number. Bentonite: Western Bentonite. Binder: Cereal type, proprietory. Cement: Portland, high-early-strength, Fed. Spec. SS-C-201 a. Oil: Linseed, alkali-refined, N.D. Spec. 52-0-17. Universal mix: No longer used in our foundry. * Truline binder.

TABLE III—Mixes Recommended for Use for Molding Nonferrous Metals

Metal	Representative Types	Casting Size	Property or Quality Most Desired	Recommended Mixes In Order of Preference
Brasses	Naval Cast,	Small (1)	Smooth casting.	100.
	Commercial,	Medium	Smooth casting.	100, at times 60, talc-washed.
	Electrical, Mn Bronzes.	Large	Strong, permeable sand.	Gravel, surface-washed (2).
Bronzes	Gum Metal,	Small	Sound metal, free from gas.	Cement, 100.
(Low Tin, for Pressure)	Valve Bronze,	Medium	Sound metal, free from gas.	Cement, 100.
	Ounce Metal.	Large	Strong, permeable sand.	Gravel or Oil Facing, surface-washed (2).
Bronzes	Ornamental,	Small	Smooth, sharply defined detail.	Plaque, 150.
(Low Tin,	Cu-Si,	Medium	Smooth surface.	100.
Structural	Al-Mn.	Large	Ditto. Plus strong sand.	Gravel or Oil Facing, surface-washed (2).
Bronzes	Bearing,	Small	Smooth surface.	150 surface-washed (3).
(High Tin, High Lead)	Phosphor.	Medium		100 surface-washed (3).
		Large	Ditto, plus strong sand.	Oil Facing or Gravel, surface-washed.
Aluminum	43	Small	Smooth casting.	150.
& Al. Alloys	195	Medium	Buckle resistant.	Anti-Buckle.
	214	Large	Smooth casting.	150.
	356			
Monels	Straight,	Small	Flawless surface.	Oil Facing.
	Silicon,	Medium	Flawless surface.	Oil Facing.
	Inverse.	Large	Flawless surface.	Oil Facing.
CRS & HRS	25-20	Small	Smooth surface.	100.
	15-35	Large	Strong, refractory sand.	Oil Facing.
	29-9			

Notes: (1) Small: 1 to 50 lb. Medium: 50 to 250 lb. Large: 250 to 5,000 lb. (2) Wash: Blacking. (3) Wash: Zirconite or "Oilless" or "Ballcote".

TABLE IV—Core Sands for Nonferrous Metals

Mix No.	Base Sand: Kind	% By Wght.	Grain Size	Additions—Percent of Base: (1) Flour	Bentonite	Cereal Binder	Linseed Oil	Water	Min. Dry Perm.	Uses
C-5	Silica	50	60							
	Silica	50	100	2.6(s)			1.67	6.5-7.0	90	General run of bronzes
C-6	Silica	100	150	3.9(s)	1.15		2.20	8.5-9.5	25	High tin, lead, and phosphorus bronzes.
C-7	Gravel	33	15							
	Lumberton	33	100							Large bronze and brass
	Albany	33	190	1.42(Wh)		.57 Rosin		7.5-8.5*	10	castings
C-13	Silica	100	100	23.0(z)		.30	1.50	6.5-7.5	30	For silicon monel castings
C-14	Silica	75	150							
	Silica	25	100	2.0(w)		.60	1.50	7.5-8.5	40	Aluminum Castings
SiC	Sic									
	Carbide	100	60	3.0(z)		.10	1.50	6.0-6.5	90	Chilling hot spots
Cement	Silica	100	60	10.9(c)				5.0-6.0	100	Pressure bronzes

(1) S—=Silica. Z=Zirconite. W=Wood. Wh=Wheat. C=Cement. * 1:16 Molasses water.

Resinous Sealants FOR POROUS C

The author's investigation of impregnating porous castings by the vacuum-pressure method suggests that this procedure may be permissible in emergencies but that, in general, the foundryman should exert every effort to produce sound castings instead of trying to remedy porosity

THE production of castings capable of retaining liquids or gases under pressure is a foundry problem that frequently entails considerable difficulties. Porous castings may result from: 1. The use of a metal that has an inherent tendency towards microporosity, 2. Incorrect foundry techniques, or 3. Design requirements that do not provide for adequate feeding during solidification, etc. In any case internal cavities exposed during machining may provide passageways for leakage when the castings are placed in service.

Some alloys which have rather wide solidification ranges, such as certain magnesium alloys, are quite susceptible to microshrinkage. Castings of magnesium alloys, used as containers for fluids under slight pressure, therefore are frequently treated with sealants to prevent leakage. Such treatments have been satisfactory in light-metal castings for low pressure service, but the problem of eliminating porosity in castings of other metals that have to operate under more severe conditions of temperature and pressure

TABLE I—Results of Exposure of Sealed Specimens at Elevated Temperatures

Sealant	Number of Specimens Tested	Number of Specimens Pressure Tight* After 5 Hours at: 400 F	500 F	600 F	700 F
No. 13	5	4	4	1	0
No. 14	5	3	1	0	..

*Pressure tested at 600 psi for 5 minutes.

TABLE II—Results of Tests on Sealed Specimens at Pressures Higher Than 600 psi.

Sealant	Number of Specimens Tested	Number of Specimens Pressure Tight After 5 Minutes at: 700 psi	800 psi	1000 psi	1200 psi
No. 13	3	3	1	1	0
No. 14	4	3	0	..	..

TABLE III—Results of Exposure of Sealed Specimens in Liquids

Sealant	Exposure Medium	Number of Specimens Tested	Number of Specimens Pressure Tight* After: 4 weeks	8 weeks	12 weeks	16 weeks
No. 13	Motor oil at 250 F	5	4	2	2	2
No. 14	Motor oil at 250 F	5	5	4	4	4
No. 13	High octane gasoline at room temperature	5	3	2	2	2
No. 14	High octane gasoline at room temperature	5	5	5	5	5
No. 13	Boiling water	5	5	4	4	4
No. 14	Boiling water	5	4	4	4	4

*Pressure tested at 600 psi for 5 minutes.

TABLE IV—Results of Sealing Treatments with Different Resins as Indicated by Pressure Tests[a]

Type of Resin	Number of Porous Specimens Treated	Percent of Specimens Sealed in: 1 Impregnation	2 Impregnations	Remarks
1. Styrene-polyester[b]	10	20	20	
2. Styrene-polyester[b]	10	20		
3. Phenolic[b]	13	46	46	Resin has high solids content
4. Styrene-polyester[c]	12	33	66	
5. Polyester[c]	10	50		
6. Unsaturated polyester[c]	10	20	30	
7. Unsaturated polyester[c]	10	30	..	Resin No. 6 with wetting agent
8. Styrene-alkyd[c]	10	30	..	
9. Phenol-formaldehyde[c]	10	30	..	Low molecular weight resin
10. Resorcinal-formaldehyde[c]	9	11	..	Fast curing resin
11. Styrene-alkyd[c]	10	20	..	
12. Phenolic with siliceous filler[b]	10	10	..	Resin contains 65% solids
13. Phenolic[b]	38	58	79	Resin contains 52% solids
14. Styrene-polyester[d]	36	47	86	

a. Specimens were tested at a hydrostatic pressure of 600 psi for 5 minutes.
b. Recommended by the manufacturer for general use.
c. Resins not marketed as sealants.
d. Recommended by the manufacturer for aluminum or magnesium alloys.

Fig. 1—Micrograph of a section of a copper-silicon alloy casting showing microporosity. Unetched, X500

Fig. 2—Porous aluminum casting showing the exudation of resin that occurred during curing

Fig. 3—Impregnating chamber used in sealing porous castings

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sCASTINGS

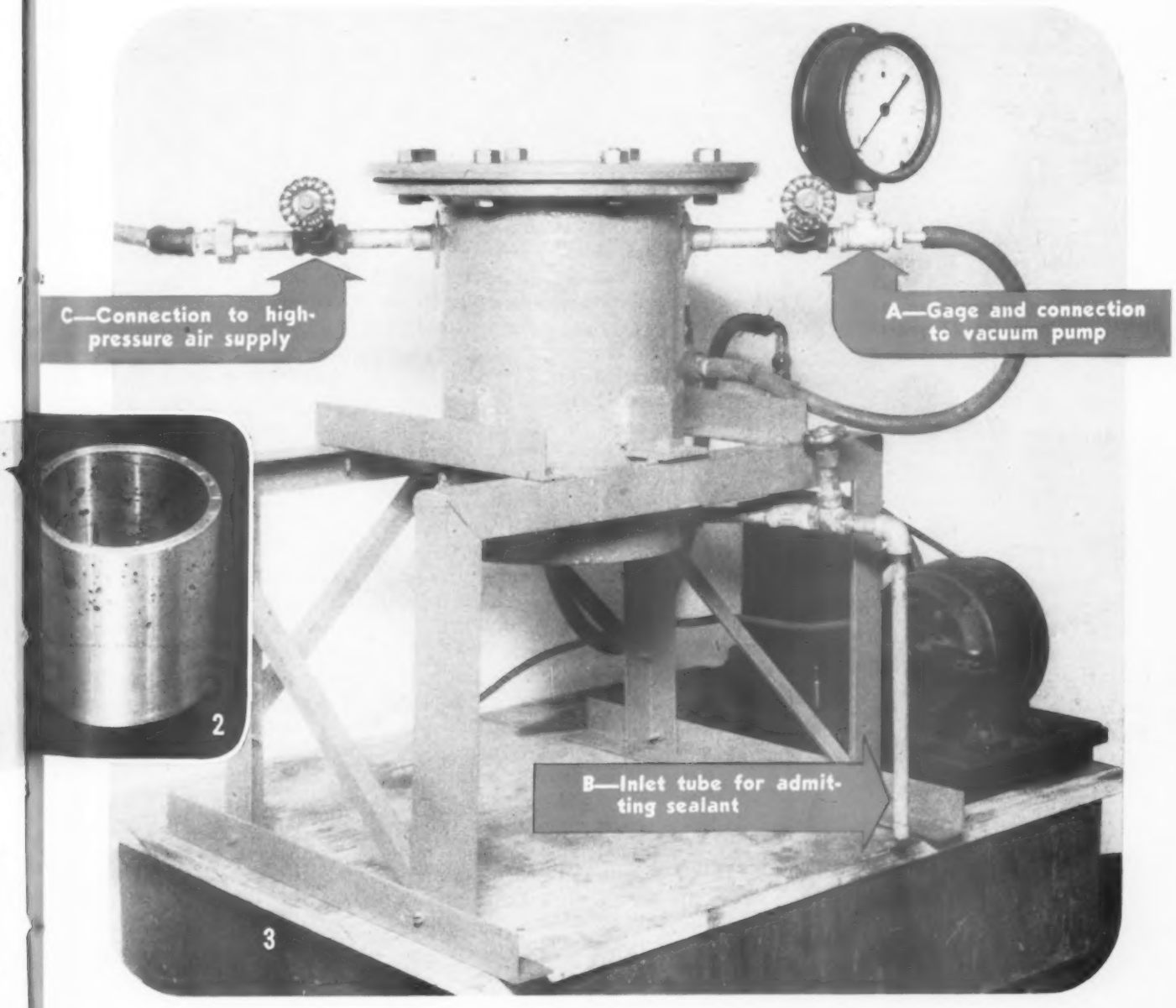
is considerably more difficult for various reasons.

During the recent war period when a high rate of production of vital war materials was essential, the output of pressure-tight bronze castings of certain hydraulic marine fittings and other castings was hampered seriously because of porosity rejections. In instances where the mechanical strength of the fittings was ample, in spite of the porosity, it was suggested that leaky castings could be salvaged through the use of suitable sealants as in the case of the lighter alloys which usually were treated satisfactorily.

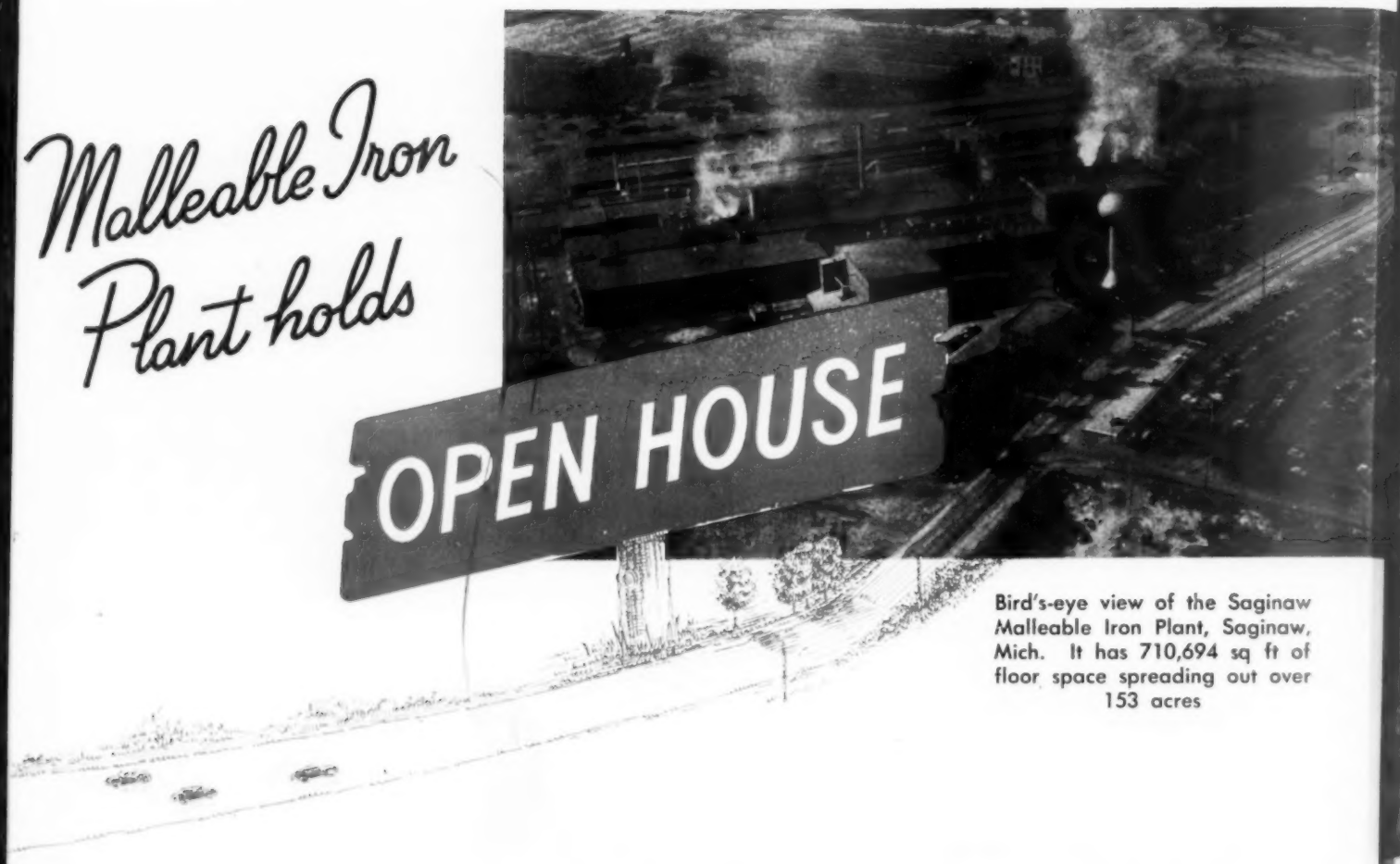
Although considerable work was done in this connection, very little information has been published on the subject. Some of the materials that have been tried are linseed oil[1, 2], shellac[2], sodium silicate solutions[2, 3], and various types of synthetic resins[2, 3, 4, 5]. In the case of castings of iron and steel, salt solutions[2, 6] have been used for accelerating the formation of rust-like corrosion products for "plugging" voids. Corse[7] reported that alcoholic solutions of phenol-formaldehyde resin were used as sealants for aluminum crankcases during World War I and that H. W. Gillett used this resin as early as 1912 for sealing aluminum intake manifolds for automobile engines.

In the case of magnesium castings, tung oil is reported[8] to be a very satisfactory sealant, but during World War II its use for this application was prohibited by the War Production Board; consequently other sealants had to be developed. Satisfactory results were obtained on magnesium castings with mixtures of styrene with either a heavy bodied linseed oil or with certain synthetic resins[10, 11].

A satisfactory sealant should have low viscosity and good wetting properties so that (*Please turn to page* 212)



Malleable Iron Plant holds OPEN HOUSE



Bird's-eye view of the Saginaw Malleable Iron Plant, Saginaw, Mich. It has 710,694 sq ft of floor space spreading out over 153 acres

Fig. 1—At work on a metal pattern is Ralph Rheaume, veteran patternmaker employed at Saginaw for 27 years

SAGINAW Malleable Iron Plant of General Motors Corp.'s Central Foundry Division was host to approximately 8000 persons of the Saginaw, Mich., community during the four-day open house it conducted Oct. 8 to 11. School groups, professional and business leaders, clergymen, and officials of other industries were among the guests.

Its extensive building program virtually completed, Saginaw Malleable made detailed arrangements to handle the large number of visitors. Specially trained guides took the guests through the plant in small groups, while numerous displays depicted the use of malleable castings in various forms.

When Saginaw Malleable first started operations 29 years ago last October it had a daily casting capacity of 80 tons. Since that time the plant floor space has been expanded ten times, with an increase in daily capacity to 1200 tons, to make the organization what is said to be the largest malleable iron foundry in the world. The plant produces more than 350 different castings varying in weight from a few ounces to 70 lb. During the war part of the plant was partially converted for a short time to the production of steel castings, but the foundry subsequently was reconverted to its normal products of malleable iron and pearlitic malleable iron castings.

The recent open house was the first the company has held in eight years, during which time a number of changes have been made in facilities and practices. Many of these changes have had a beneficial effect on working conditions through better illumination and ventilation and through a simplification of various operations. This simplification, based on motion time analysis, was described in detail in "Finding a Better Way To Do the Job," THE FOUNDRY, October, 1945. In certain instances new mechanical devices were developed to reduce manual effort, as typified by the boom hoist shown here in Fig. 3.

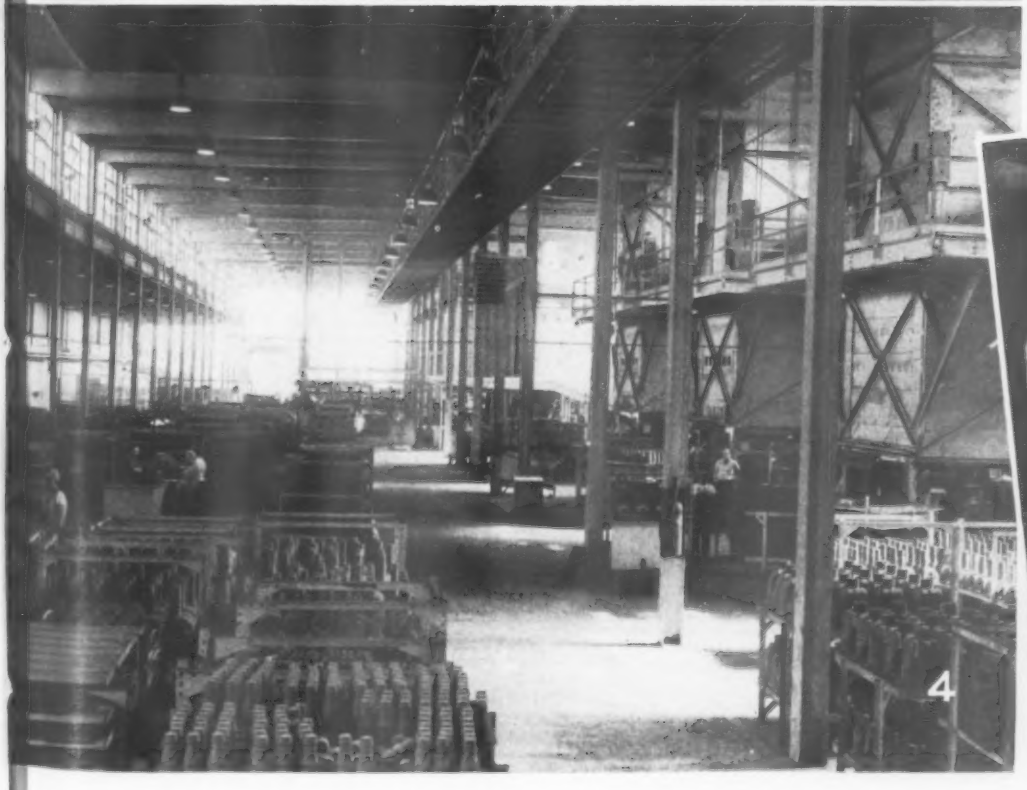


Fig. 2 — Girls inspect, chip, grind and test castings for hardness in this well lighted finishing department

Fig. 3—Group of Saginaw Malleable and General Motors officials in attendance at the open house. Left to right are: M. E. Coyle, executive vice president, General Motors Corp.; B. A. Dollens, then general manager of Saginaw Malleable and now assistant general manager, Electro-Motive Division, La-Grange, Ill.; F. L. Burke, vice president, Accessory Divisions Group; J. H. Smith, then assistant to Mr. Burke and now general manager, Central Foundry Division; W. H. Doerfner, general manager, Saginaw Steering Gear Division

Fig. 4 — Core department, showing three vertical baking ovens (upper right) and one horizontal oven in background

Fig. 5—With the aid of a mechanical hoist developed by the company, Joe Zopota assists Bernard Mueller in closing a mold

PILOT FOUNDRY

Aids Product Development

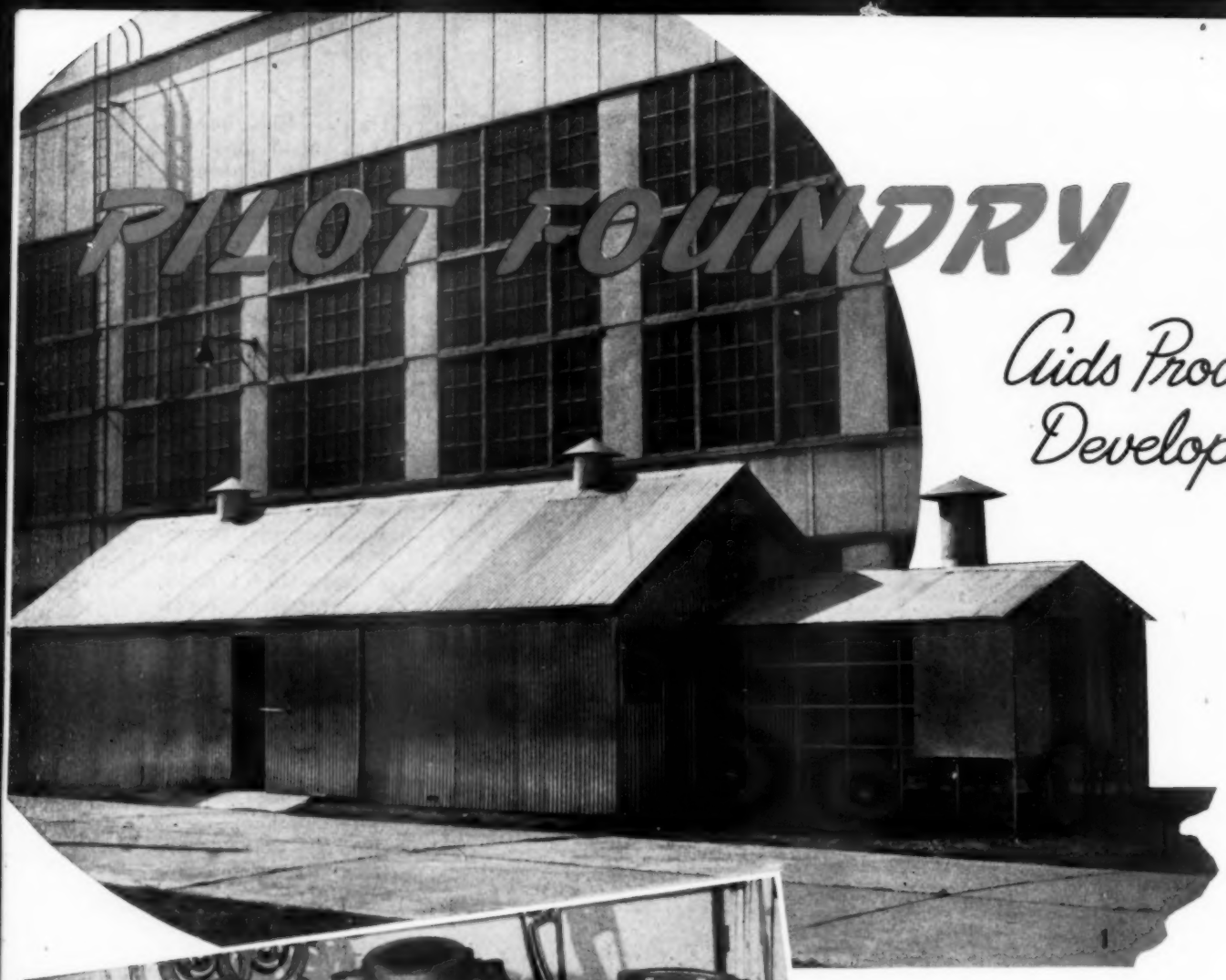


Fig. 1—Pilot foundry of Reynolds Metals Co. at Louisville has corrugated aluminum roofing, siding and framing

Fig. 2—Typical items made in the foundry

Fig. 3—Melting furnace is 60-lb capacity. Open housing gives added ventilation

Fig. 4—R. B. Wemyss, Reynolds industrial designer, sketches a new item prior to its being cast in the pilot foundry

Fig. 5—Placing core in oven for baking

Fig. 6—Pouring largest casting attempted in pilot foundry—90 lb finished weight

Fig. 7—Pouring typical size casting

Fig. 8 — Making mold for truck door corner reinforcement casting

FOUNDRYMEN accustomed to reading about production foundries and production casting operations may be interested in a shop that is just the opposite. Instead of large runs, this foundry seldom makes more than a dozen castings from one pattern. It is a "pilot" or developmental foundry used exclusively for working out new products.

It came into existence to fill a serious gap in the development work done in Reynolds Metals Co.'s 11 plants in Louisville—part of Reynolds' extensive efforts to bring aluminum into new fields. Typical of these jobs is the line of all-aluminum truck and trailer bodies now in production at Reynolds' Louisville Plant 12. These bodies utilize a number of cast aluminum fittings in corner posts, hinges, understructure, hubs, spiders, brake shoes, etc. This is an important field for aluminum because estimates have shown savings of $1 to $2.50 per year for every pound of weight that can be saved.

Before making up permanent molds for casting such parts, it is of course necessary to have the design of the part perfected. To procure such early designs for testing, it formerly was necessary to take patterns for the experimental parts to a local foundry to get one or two castings. To a regular production foundry such jobs are "special." The foundry may not have men, metal or equipment available to work on them for some time. Result is that these jobs were often delayed a week, two weeks or more. And one could never be sure of getting a good casting the first time, mainly because the job did not warrant the effort from the foundry's point of view.

Late in 1945 the situation became acute because of the many new products being developed. So the pilot or developmental foundry was set up. It now handles two very important functions: First, it enables the designer to see what his design actually looks like in metal. It supplies the missing link in the sequence from drawing board (Fig. 4) to the actual casting that shows appearance of the product itself. Second, it greatly facilitates experimental work, since a change can be made in a pattern and a new casting made available for testing in as short a time as 15 minutes. This developmental work is of the utmost importance because certain parts may be in the experimental stage for as long as six months with 20 to 30 engineering changes made during that time. It is evident that having a quick method of translating these design changes into metal is extremely important.

For example these casting facilities have been found exceptionally valuable in working out designs for aluminum golf clubs—a special new idea of hollow club with adjustable weights, shortly to be in production at rate of 2000 daily; in working out accessories for aluminum truck and trailer bodies; in developing designs for kitchen utensils, nameplates, plaques, awards, ornamental novelties, etc.; in designing boat accessories such as oarlocks, deck ornaments, and the like. (*Please turn to page* 234)

8

7

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6

Modified Colorimetric Determination of CHROMIUM in Ferrous Materials

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AN ACCURATE and rapid determination of chromium in ferrous materials can be accomplished by the method described here. The metal is dissolved in a high oxidizing acid and re-oxidized with a powerful oxidizing salt in aqueous solution. Filtrate is obtained and quickly measured, color reagent added, pH adjustment made, and measurement made using an electrophotometer or similar apparatus.

Experimental—This procedure is a modification of the one originated by Garratt and Mellan. These authors oxidized chromium with sodium peroxide in an alkaline solution. The adjustment of the acidity and the complexing of the ferric ion was made with one part phosphoric acid to four parts sulphuric acid. To this solution was added an aqueous solution of sodium-1, 8-dihydroxynaphthalene-3, 6-disulphonate. The presence of vanadium and free carbon effects the formation of the pink color, and if the concentration of vanadium is equal to that of chromium a brown color forms, thus limiting the procedure.

The above procedure was used as the skeleton for the proposed modification. The silica is removed by filtration and the filtrate cooled and used for the colorimetric analysis of manganese, phosphorus, and chromium. A dehydration in perchloric acid was attempted, the sample being oxidized with the copious fumes of perchloric acid until just short of dryness and cooled to the salts of iron perchlorate. This procedure was effective with some types of cast iron and steel, but formed a yellowish brown with gray iron, pig iron, silvery iron, and some steels.

A more radical form of oxidation was then tried. Various oxidizing salts were used in the filtrate and in the dehydration, the dehydration stage giving the better results. A solution of potassium chlorate is added to the first dehydration, thus forming a precipitate of manganese and chromium which dissolves after boiling in the condensed fumes of perchlorate and perchloric acid. After filtering the silica from the dissolved solution, an aliquot portion of the filtrate is taken for chromium, acidified with an acid solution of one part sulphuric and three parts phosphoric acids, this being almost the reverse of reagent quantities recommended in Garratt's procedure. The transmission measurements were made with a Fisher electrophotometer.

Procedure—One gram of sample is weighed into a 200-ml Berzelius tall form pyrex beaker with pyrex cover. A solution of 15 ml $HClO_4$, 5 ml HNO_3, and 5 ml H_2O is added, placed on the hot plate, and boiled reasonably fast. After condensate has dripped into the boiling solution remove from heat. Cool slightly and add 10 ml of a 5 per cent solution of $KClO_3$. Place on source of heat boiling to fumes as before. After a few drops of condensate have dripped into the solution, oxidation should be complete.

Now removed from source of heat, cool to the starting of crystallization, and place into a cooling bath until solid crystals are formed. Remove from bath, add about 100 ml of hot water, filter with suction using No. 597 S & S or similar density filter paper, and collect filtrate in a clean flask. Flask containing filtrate is cooled. The residue in the filter paper is washed alternately with (1 to 3) hydrochloric acid and hot water until iron stains are removed (about three washings) and finally with hot water until chlorides are washed out. Washed paper containing residue of silica is placed into a crucible and burned. Residue is cooled and weighed as silica being converted if desired to silicon. Filtrate is now made up to 250 ml and is to be used for the determination of manganese, phosphorus, and chromium.

An aliquot of 200 ml is used for chromium. Ten ml of pH acid (3.75 ml H_3PO_4, 1.25 ml H_2SO_4, and 5 ml H_2O) are added to the solution and shaken. Four ml of ½ per cent aqueous solution of sodium-1, 8-dihydroxynaphthalene-3, 6-disulphonate are added, solution again shaken, and after two minutes measured using a green filter (No. 525-B).

Time—This analysis can be completed within 6 minutes from the time the filtrate is placed in cooling bath, or 25 minutes from the weighing of the sample.

Materials Tested—Steel, pig iron, gray iron, silvery iron, cast iron, annealed iron, and alloy steels can be tested by this procedure.

COMPARISON OF COLOR BY PERCENTAGE

% Cr	Degree of Color	Permanency
0.672	Deep red	30 min.
0.159	Deep pink	30 min.
0.065	Pink	30 min.
0.053	Slightly lighter than 0.065	30 min.
0.035	Lighter than 0.053	30 min.

EFFECTS OF STRAY ACIDS

Acid	Effect
HCl	None
HNO_3	None
H_2SO_4	Affects color
H_3PO_4	Affects color
$HClO_4$	None

Effects of Alloying Elements—Since vanadium has a tendency to develop a brown color an amount greatly exceeding the percentage of chromium would cause erratic results. Manganese, silicon, molybdenum, and tungsten do not effect the determination.

Permanency — Curves may be made from potassium dichromate and iron powder or from steel and cast iron standards. (*Please turn to page* 182)

PLAN FOR

1947 AFA CONVENTION

Detroit's art center; Rackham Memorial at extreme right

FOUNDRYMEN will review the casting industry's wartime and postwar developments and survey its peacetime engineering potentials when they meet in Detroit, Apr. 28 to May 1, for the 51st annual convention of the American Foundrymen's Association. And as the industry's leaders in management, engineering and technology focus their attention on the problems lying ahead, they are expected to place the predominant stress on intensified research and engineering to accelerate product, plant and process improvement.

In the program planning of the society's aluminum and magnesium, brass and bronze, educational, gray iron, malleable, pattern-making, steel and sand divisions, this first Detroit meeting of the association since 1936 is shaping for unusual breadth of perspective and for practical, down-to-earth approaches to the many technical and other problems to be solved if the foundry industry is to meet the peacetime challenge for full, costs-down-quality-up production.

To enable and encourage exploration and discussion of each topic of the four-day meeting, the program committees, reflecting recent revisions in the overall planning of AFA technical activities, have decreased, rather than increased, the number of scheduled papers. In broadened and intensified discussion the committees hope to mirror a new vigor of program and the stepped-up tempo and broadened scope of the activities of their divisions.

Throughout the convention there will be morning, afternoon and evening sessions, plus committee and special group meetings. While most sessions will remain technical in character, the program as a whole will re-emphasize, with a variety of educational lectures, shop courses, general interest addresses, topics of definite management interest and the like, that a foremost AFA objective is the encouragement of the advancement of the castings industry in all its branches and every department.

One of the highlights of the convention will be the presentation of the first Charles Edgar Hoyt Lecture. Recently, by action of AFA directors, on recommendation of the annual lecture committee, the AFA Foundation lectureship established in 1943 was renamed to honor Ed Hoyt who, prior to his retirement as treasurer of the association Aug. 1, had served in appointive and elective offices of AFA for nearly thirty years. He staged one of the first exhibits of foundry equipment and supplies in 1906 and every AFA-sponsored thereafter, crowning his efforts with the record-breaking exposition that complemented the association's Golden Jubilee Congress which was held in Cleveland last year.

First lecturer in the Charles Edgar Hoyt series will be Dr. James T. MacKenzie, chief metallurgist, American Cast Iron Pipe Co., Birmingham, Ala. He has chosen as his subject "The Cupola Furnace." An outstanding foundry technologist and AFA member since 1921, Dr. MacKenzie is not only eminently qualified to discuss the subject he has chosen and to maintain the tradition of the AFA lectureship, but also to convey fully the high tribute the association intended in the renaming of the Foundation lecture.

AFA's Detroit Chapter, headed by A. H. Allen, resident editor, THE FOUNDRY, as chairman and C. E. Silver as vice chairman, will be the official host chapter to the "50 plus 1" convention. It is expected, however, that the Detroit group, will share that honor with the Michiana, Saginaw Valley, Western Michigan and the Toledo chapters, inviting them to name representatives to serve on various local committees. Formation of the reception, banquet, ladies entertainment and other convention committees will be completed by the Detroit Chapter in the near future.

AFA headquarters on Dec. 15, mailed hotel reservation application blanks for the Detroit convention to all members of the association. W. W. Maloney, AFA secretary-treasurer, pointing out that all hotel rooms for the convention will be assigned through an official housing bureau, requested that member application for hotel accommodations be made promptly. Hotel application blanks will not be mailed to nonmembers prior to Jan. 15. Assignment of rooms will be made by the (*Please turn to page* 120)

Questions and Answers

Discusses Special Riser Types

Q.—Can you tell us where descriptive material has been published on the Williams' head and the Washburn riser? One method uses a core in a blind head, and the other a separator core which necks down the riser to allow removal by flogging.

A.—Detailed information on the blind-atmospheric or Williams' type riser was contained in the October, 1942, issue of THE FOUNDRY in an article entitled "Applies Atmospheric Pressure To Secure Sound Castings" by H. F. Taylor and E. A. Rominski. The application of carbon rods instead of sand cores as a means of admitting atmospheric pressure to blind risers was described in a series of two articles by F. J. Vosburgh and H. L. Larson which appeared in the January and February, 1944 issues of THE FOUNDRY.

C. W. Briggs in his recently published book *The Metallurgy of Steel Castings* states with reference to the Washburn riser that 4 to 6-in. diameter risers will feed castings with similar sections through a 1-in. hole or neck in a core 1 in. thick. Use of those risers also was discussed by W. E. Jones in a paper presented at the 1946 convention of AFA under the title "Conventional vs. Washburn Risers for Steel Castings."

Desires Catalog for Patterns

Q.—Our present job is to order patterns and molds. We want to learn more about them, but are not interested in patternmaking. Can you refer us to any book from which we can learn to pick out the proper kind of pattern to be used for various amounts of castings? Also a description of the various types of patterns.

A.—Briefly, the answer is no. So far as we know there is no book of the character you have in mind. Selecting and specifying the type of pattern best suited to the production of any casting or line of castings is a job that should be entrusted only to a man of wide experience, a man familiar with all the conditions under which the pattern will be used. This is a form of knowledge that can be acquired only by long study, observation and application. As with every form of knowledge worthy of the name, there is no royal road to its attainment. Your brief and casual comment that you are not interested in patternmaking would seem to indicate that you sadly underestimate your problem. Working knowledge or reasonable familiarity with pattern shop practice is an essential base for any person subsequently engaged or in contact with any of the many and complicated angles of the pattern problem.

A brief classification of patterns, with which you may or may not be familiar, is taken from *Wood Patternmaking* by H. J. McCaslin: Patterns are classed as standard, medium and temporary. Standard patterns are those used constantly or at frequent intervals. They are to be so constructed as to withstand a long period of use. Every feature that might expedite the making of the mold should be embodied in their arrangement. Patterns of this type should be returned to the shop at intervals for revarnishing and for minor repairs. Medium patterns are those used occasionally and, therefore, may be of a cheaper nature. However, the quality of the material used and the features of construction should be such that the pattern will retain its accuracy of form and dimension. Temporary patterns are used when only one or two castings are required. They are made as cheaply as the case will permit. Patterns of this type, although saving in pattern cost, often require extra work on the part of the molder in finishing the mold.

Patterns are made of wood, aluminum, brass, bronze, iron, plaster, wax and proprietary materials. The patternmaker is in a better position than any other person to decide which type of pattern is best for any given purpose. That is his business. He is a professional. An amateur buyer, faced with the problem of ordering patterns, safely might leave the decision to the man who is going to make them.

Wants To Obtain Hotter Iron

Q—We are having difficulty in obtaining hot iron from our cupola lined to 48 in. Bed is formed of 1700 lb coke which brings it 38 in. above the tuyeres. Coke bed is lit at 10:30 a.m. with a kerosene torch for 20 minutes, the fuel turned off and the air left on to burn the bed through. Charges are 1500 lb metal with 160 lb coke splits. Blast, which is 10 oz. at windbox, is turned on and in approximately 6 minutes iron can be seen melting at the tuyeres. In 20 minutes cupola is tapped. Approximately 1000 lb of first iron is inclined to be dead, and then it gets hotter. However, it is not hot enough. We get back from the bottom drop approximately 800 lb coke and 800 to 1000 lb iron.

A.—Adjustment of the cupola to secure maximum temperature, or at least high temperature iron, usually is accomplished by cut-and-try methods, as you probably know. The data you give pertaining to bed height and appearance of metal at the tuyeres seem to jibe with general practice, but in our opinion the coke splits are on the low side. That would lead to a lowering of the bed with resultant cold iron. However, you state that the iron becomes hotter after the first 1000 lb which theoretically should not occur unless the weight of the coke splits is increased sufficiently to build the bed up to the proper height—which might be taking place through some one remembering past trouble, and adding an extra forkfull or two to "sweeten-up" the coke split.

Therefore, we suggest a change in your present iron to coke ratio which is approximately 9.4 to 1 down to about 8 to 1. Perhaps you may have to go slightly lower to get the iron as hot as you want it. Two procedures are

available to accomplish the desired change. One is to use the present amount of coke in the split and reduce the iron charge, and the other is to let the iron charge stand, and increase the coke in the split. In the first method the iron charge would be reduced to 1250 lb, holding the coke split at 160 lb. and giving an iron to coke ratio of 7.8 to 1. In the second the iron charge would be maintained at 1500 lb while the coke split is increased to 190 lb, or an iron to coke ratio of 7.9 to 1.

Your method of burning the bed through seems to be a good one as it should insure ignition of the coke from the sand bed up—raising the temperature of the bed as well as the walls of the cupola well or reservoir. However, we believe that as an added precaution it might be well to turn on the cupola blast for a few minutes to make sure that the top portion of the coke bed is burned through thoroughly. It appears also that your blast pressure is somewhat low as we would expect a pressure of around 18 oz. However, blast pressure is not as important as the amount of air entering the cupola, and a rule-of-thumb method of ascertaining the required amount is 30,000 cu ft air per ton of iron melted.

As far as the amount of coke and iron recovered in the drop is concerned, we believe that a more careful mold count will aid in reducing the drop to a minimum. By mold count we refer to an estimation of the amount of metal which will be required to pour off the day's work. As a guess we would say that you are putting in about one charge too much—and that is borne out by assuming that your coke weighs 28 lb per cu ft. Since the area of a 48-in. diameter cupola is 12.57 sq ft, the 1700 lb bed would extend 60.7 in. from the sand bed. You mention that the bed extends 38 in. above the tuyeres which would leave 21.7 in. of coke below the tuyeres. The 800 lb of coke in the drop would extend 27.6 in. above the sand bottom, or say 6 in. above the tuyeres—presumably to the lower edge of the melting zone. Hence, you are using nearly one charge of iron too much. However, we would expect the lower edge of the melting zone to be higher than 6 in. above the tuyeres—indicating as we previously mentioned that the coke splits should be increased.

Brass Castings Show Defects

Q.—We are having trouble with yellow brass castings in that they show rat tails and zinc marks on the surface. We use flux and a bit of aluminum in the metal, but that does not seem to stop it. The castings are all thin.

A.—While the zinc marks are due to the alloy used, or perhaps we should say, the method in which it is handled, the rat tails you mention are caused by the molding sand being used. You mention that the castings are thin, and that indicates you are pouring at high temperatures. Naturally, the higher the temperature employed the greater the amount of zinc that is being volatilized, and which appears as zinc smoke. One suggestion to overcome the trouble is to employ lower pouring temperature—just sufficient to pour the castings without cold shuts. Another is the practice you mention, of using a small amount of aluminum. The amount usually is about 2 oz per 100 lb of brass, although some use up to 5 or 6 oz. However, with high aluminum, gating methods will have to be adjusted so that the metal flows in without turbulence. With high zinc alloys free from aluminum it is essential that the molten metal be shot into the casting cavity as quickly as possible. Hence, the sprue, gate and runner should be larger than for red brass.

The rat tails you mention are due to the expansion of the sand, and may result from ramming too hard. Try easing up on ramming and see what effect that has. If that does not correct the trouble, you may have to change to a different sand, or make adjustments in sand and clay content to provide a better cushioning effect. Possibly what you term rat tails may be what more usually is known as worm tracks or wormy surface, and are due to zinc smoke depositing on the cold mold surface. Remedies for that condition have been outlined previously.

Make Matchplate in Sand Mold

Q.—We shall appreciate any information on the subject of making sand cast aluminum matchplates.

A.—Windsor Locks sand is employed on fine, intricate designs, but is not necessary on the majority of aluminum matchplates. Any fairly fine sand will serve satisfactorily. Sand of any kind is worked drier and rammed more gently on aluminum than on iron or brass castings. Sand for any kind of aluminum castings should be worked on what the molder calls the dry side. Where a measuring instrument is available, this means a moisture content between 3 and 4 per cent. Facing material is not required on molds for aluminum castings except in special cases where it is advisable to skin dry the face. In instances of that kind the face of the mold may be

GANGWAY! By J. A. Patterson

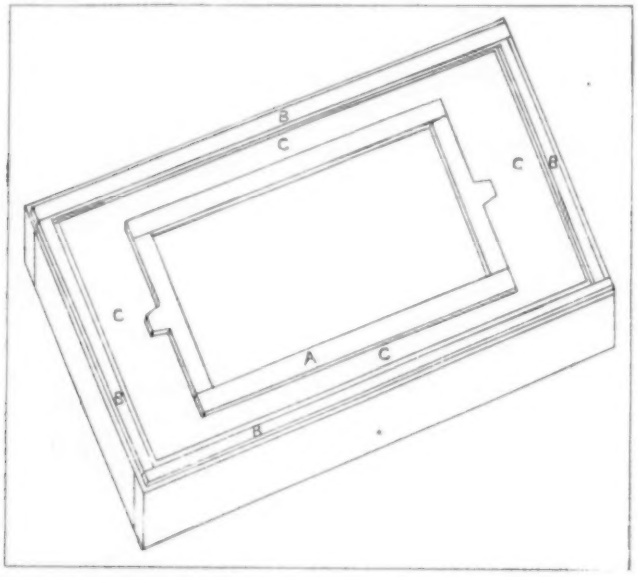
"It ain't enough I should have a blowout on my car this morning—this had to happen."

sprayed with molasses water or any other water soluble binder.

Temperature of the metal is around 1300 F. For certain plates flame drying is preferable to air drying, but in the majority of instances neither is necessary. Several aluminum alloys are available. Your best plan probably would be to order direct from any of the manufacturers who cater to the foundry trade and whose addresses are in THE FOUNDRY. If you prefer to make your own mixture, an alloy recommended by a prominent pattern manufacturer contains 92 per cent aluminum, 3 per cent silicon and 5 per cent copper. This combination first is melted and cast into ingots. The ingots are remelted in any desired quantity for the plate or plates. You can use the standard No. 12 aluminum alloy, containing 92 per cent aluminum and 8 per cent copper, as a base. The necessary adjustment in copper and silicon can be made by adding the required amount of aluminum-copper and aluminum-silicon. These alloys, known as hardeners, can be purchased in prepared form.

To keep the patterns in good working order, they are sprayed with kerosene or gasoline in which a small amount of tallow has been dissolved.

The greater part of making the aluminum matchplate conforms to ordinary foundry practice. Briefly, after the cope and drag are separated, wood or metal strips the thickness of the desired plate are laid on the upper edges of the sides and ends of the drag flask. A wood frame



Drag half of mold with plate templet A and thickness strips B in place. The space C is to be filled with sand

corresponding to the shape of the desired plate is laid on the joint face and the space between frame and strips is filled with sand, rammed down and slicked off flush. The cope then is returned to place. The mold is clamped and filled with metal. With a flat face, or a split pattern, the joint is made plain and simple. Where the joint is irregular, a little additional work is involved in making the parting. The pattern either is blocked up on the rollover board, or is bedded part way in a false cope. The drag is rammed and then the assembly is rolled over. The false cope is shaken out and the proper parting is made around the pattern in the drag.

Heavy metal sections or metal parts that project into the cope are inclined to develop shrinkage areas. These are anticipated and prevented according to one or two methods. In the first, metal inserts are placed in the mold. In the second, suitable feeding risers are placed at strategic points. Aluminum wire inserts, straight or spiral, are stuck in the sand with the body projecting into that part of the mold where shrinkage is anticipated, or where it has appeared in a former trial. In extreme instances a junky piece of aluminum takes the place of the wire. The object is to cool the metal rapidly in the vicinity and thus to some extent equalize the cooling and shrinkage speed between the thick and thin parts of the casting. Location, diameter and height of the riser or risers will depend on the shape and size of the casting.

Aluminum Castings Show Dross

Q.—We are making aluminum plates 14 x 18 in. with a metal thickness of ¼-in. The plates have a 1 in. high rim around the edges and a number of stiffening ribs. Castings are gated into the narrow dimension from runners 5/8 x 3/4-in. feeding into 2 gates 1/8 x 3 in. Castings are poured from two ladles, one at each end. Metal is heated between 1250 and 1300 F; skimming at the furnace and at the mold. Ingots only are used, and the metal agitated as little as possible during skimming. Sand is Albany No. 0 with 6 to 8 per cent moisture and a permeability of 20. Main trouble is pinholes, dirt and porosity showing after castings are machined; a 1/16-in. cut is being taken. Castings look perfect when taken out of the sand. Machining is performed on the cope side of the casting.

A.—Examination of the section of the casting forwarded to us indicates rather abundantly the pinholes and dirt you mention, and study of the holes under a low power magnifying glass shows most of them to be filled with dross. Hence, it appears to us that while you are careful in skimming the metal, the operation is not being performed properly. The drosses, oxides, etc., formed during melting aluminum alloys have above the same specific gravity as the alloy, and consequently have a tendency to remain in suspension rather than rising to the top as the case with most metals and alloys.

Therefore, the alloy must be stirred in such a manner those impurities are caused to float out of the metal. Several means are available to accomplish that result. One is to employ a pumping action in stirring which agitates the body of metal thoroughly without disturbing the surface skin to any great degree. The other is to employ the so-called degassing fluxes in dry powder or gaseous form. These fluxes, in addition to driving off deleterious gases picked up during melting, bubble through the molten metal and cause the dross and oxide to rise to the surface.

As far as gating is concerned, we believe that the casting can be poured from one ladle, placing the runner with multiple gates along the longest dimension of the casting. Gates are 3/16 x 1½ in. and four are used. Locate one at the two corners and two others about 4 in. away. The runner should be 1 in. wide and 1 1/8 in. high extending up into the cope. The sprue should be choked to about 7/8-in. at or near the bottom. If you desire to use a metal screen between sprue and runner to clean the metal, allow sufficient area so that it will not plug up.

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MEN of Industry

T. C. WEISER has been appointed operating assistant in charge of the foundry division at all plants, Griffin Wheel Co., Chicago. Mr. Weiser joined the company in 1906, as a billing clerk at the Chicago plant. He held various positions in the inspection and accounting departments there, was made chief clerk in 1913, and cashier in charge, 3 years later. In 1917 he was transferred to the Boston plant as assistant to the superintendent, and served as superintendent from 1919 to 1930. Mr. Weiser went to the Council Bluffs, Iowa, plant at that time, where he was superintendent for 7 years. He returned to Boston in that capacity, where he remained until his new appointment last September.

♦ ♦ ♦

Robert D. Sowers has been appointed to the industrial sales division of the Sharon, Pa., plant of National Malleable & Steel Castings Co., Cleveland. Mr. Sowers joined the company in 1936 after attending Westminster College, and has worked in several departments at the Sharon plant. He served in the U. S. Navy during the recent war, returning to the company last April. **Herbert H. Smith,** since 1945, field engineer for National Malleable, has been promoted to sales agent in the mine and industrial division, with headquarters in Cleveland. Mr. Smith joined the company's engineering department in 1937. He is a graduate of Fenn College.

B. P. Mulcahy, for the last 10 years research engineer, Citizens Gas & Coke Utility, Indianapolis, has resigned to establish himself as a consultant in cupola operation and coal carbonization, with headquarters in Indianapolis. Mr. Mulcahy was graduated from University of Illinois in 1925. He was chemical engineer, Associated Gas & Electric Co., Geneva, N. Y., for 3 years, when he became chief chemist, Indiana Gas & Chemical Corp., Terre Haute, Ind., remaining there until 1936. He is a past chairman and director of the Central Indiana Chapter of the AFA and has served on that association's Cupola Research Committee.

♦ ♦ ♦

Franklin Farrel III, newly elected vice president, National Founders Association, has been secretary and assistant to the president, Farrel-Birmingham Co. Inc., Ansonia, Conn., since 1945. Following graduation from Yale in 1931, he worked for Young & Ottley, New York, investment counsel company. In 1933 he joined Farrel-Birmingham, starting in the foundry, and became foundry manager in 1937. After a brief tour of duty in the U. S. Navy he was made assistant manager of manufacturing and subsequently manager of the Ansonia and Derby, Conn., plants before assuming his present executive position.

♦ ♦ ♦

Leo Malis has been appointed superintendent, Crown Iron Works Co., Minneapolis, succeeding **Arthur Tetzlaff,** who has opened his own foundry. Until recently, Mr. Malis had been associated with American Steel Foundries, East Chicago, Ind.

♦ ♦ ♦

Clark Bennett has opened an office at 400 W. Madison St., Chicago 6, to handle in that territory exclusive sales and engineering representation for James A. Murphy Co., Hamilton, O., for the latter's after-cooling equipment and automatic traps for removing water and oil from compressed air systems. For 3½ years during the war, Mr. Bennett was a lieutenant and acting executive officer, Office of the Inspector of Naval Material, stationed one year in Philadelphia and 2½ years in Chicago. Prior to the war, he was sales engineer with Jones & Laughlin Steel Corp. in Philadelphia.

♦ ♦ ♦

Robert A. Hedges has been transferred to Atlanta, as manager of a new sales office opened in that city by Dravo Corp., Pittsburgh. Mr. Hedges will represent the company in distribution of oil and gas burning direct fired heaters and crane cab coolers, through local distributors in Alabama, Georgia, Florida, Louisiana, Mississippi, North and South Carolina, Tennessee and parts of Arkansas and Virginia. He represented a steel window manufacturing company in Atlanta, for 7 years, prior to joining Dravo Corp. in 1940.

♦ ♦ ♦

Otto E. Zahn, after 9 years as industrial and development engineer, American Wheelabrator & Equipment Corp., formerly American Foundry Equipment Co., Mishawaka, Ind., has retired, to set up his own consulting service. A graduate of University of Charlottenburg and University of Berlin, Mr. Zahn came to the United States in 1909. His headquarters will be in South Bend, Ind.,

(*Continued on page* 100)

T. C. WEISER

ROBERT D. SOWERS

B. P. MULCAHY

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(*Continued from page* 98)

where he will offer service covering patent research and development problems, product, industrial, chemical and electrical engineering, and metallurgical research.

♦ ♦ ♦

American Brake Shoe Co., New York, has announced the election of four division executives as new vice presidents of the parent company. **John S. Hutchins,** who was elected president, Ramapo Ajax Division, last year, after having served as its vice president since 1944, has worked for the company for 21 years, in a sales capacity. Last December he was made chairman of the board of directors, Canadian Ramapo Iron Works Ltd. **William T. Kelly Jr.,** president, Engineered Castings Division and the Kellogg Division, was general purchasing agent of the company for several years. He is also vice president, Canadian Ramapo Iron Works Ltd., and a director of Dominion Brake Shoe Co. Ltd. **Thomas W. Pettus,** since 1945, president, National Bearing Division, has been successively sales representative, sales manager, priorities administrator, vice president and executive vice president of that division. **Joseph B. Terbell,** executive vice president, American Manganese Steel Division, has been associated with the company mainly in a sales capacity. In 1940 he was promoted from district sales manager to vice president of the American Manganese Steel Division and has been a director, Dominion Brake Shoe Co. Ltd. since the first of this year.

♦ ♦ ♦

Howard Hansen has been appointed supervisor of the office of **J. L. Singleton,** manager of district offices, Allis-Chalmers Mfg. Co., Milwaukee. Mr. Hansen, who attended University of Wisconsin, joined the company in 1941. Since that time he has worked in the works accounting department, blower and compressor department and in the administrative office of **William C. Johnsen,** vice president of the general machinery division.

♦ ♦ ♦

Hubert Chappie has been appointed foundry superintendent, Columbia Steel Co., Torrance, Calif. Mr. Chappie, until recently, was associated with Texas Electric Steel Casting Co., Houston, Tex. Previous connections, all with the steel foundry industry, include National Malleable & Steel Castings Co., Melrose

HUBERT CHAPPIE

Park, Ill.; Lebanon Steel Foundry, Lebanon, Pa., and George H. Smith Steel Casting Co., Milwaukee, where he spent 20 years, ending his association in the capacity of foundry superintendent.

♦ ♦ ♦

Charles Q. Smith has resigned as foundry superintendent, E. I. du Pont de Nemours Co., Wilmington, Del., and has purchased the Keystone Grate & Blower Works, Chambersburg, Pa. Mr. Smith, a graduate of Pennsylvania State College, joined the Dupont company 6 years ago. Prior to that he was associated with Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., and Chambersburg Engineering Co., Chambersburg, Pa., in various foundry capacities. In 1938 he completed a course in heating and air conditioning with the Refrigeration and Air Conditioning Institute of Chicago.

♦ ♦ ♦

Howard Goodman, vice president, Goodman Mfg. Co., Chicago, has been elected president, National Metal Trades Association. A graduate of Williams College, Mr. Goodman later attended Harvard University, and joined the Goodman company, of which his father was founder, 23 years ago. He served as vice president of the National Metal Trades Association last year and has been a member of the executive committee for 5 years. He is a former president of the Chicago branch of that organization.

♦ ♦ ♦

L. H. Moulton has been appointed national sales director and **D. T. Buist** assistant national sales director of Turco Products Inc., with headquarters at the main offices in Los Angeles. Mr. Moulton joined Turco 15 years ago and has directed sales of its eastern division from the Chicago plant office, for the last 8 years. Mr. Buist joined the company in 1936, and has been western zone sales manager since 1944.

♦ ♦ ♦

H. S. Simpson, safety engineer, Caterpillar Tractor Co., Peoria, Ill., has been appointed chairman of the foundry committee of the metals section, National Safety Council. Mr. Simpson has been a member of the committee for the last 5 years and assisted when it was organized to study safety and health factors related to foundry workers.

♦ ♦ ♦

Frank W. Zenz, a molder at Cleveland Brass Mfg. Co., Cleveland, was honored recently in a ceremony at the company's plant. Mr. Zenz began his foundry career at the age of 14, when Michael

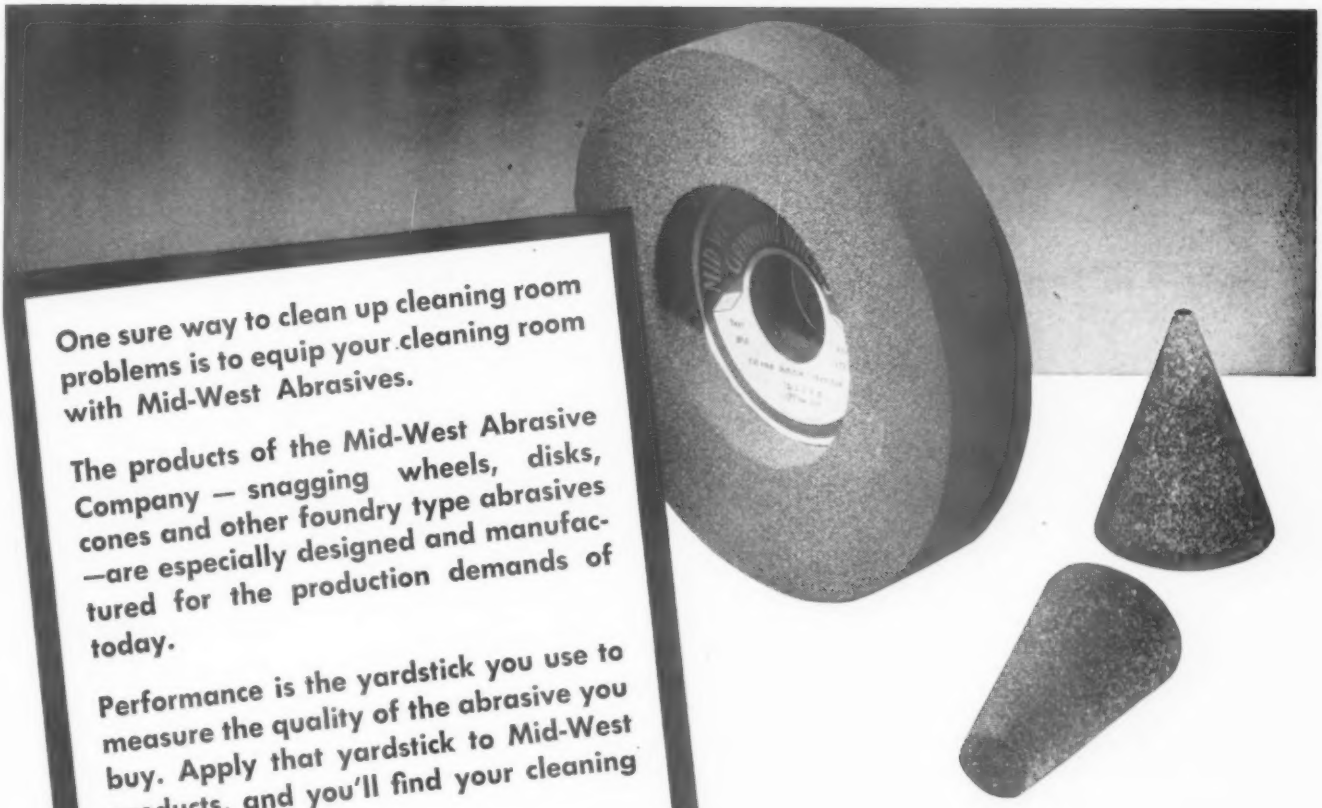
(*Continued on page* 104)

THOMAS W. PETTUS

WILLIAM T. KELLY JR.

JOSEPH B. TERBELL

JOHN S. HUTCHINS



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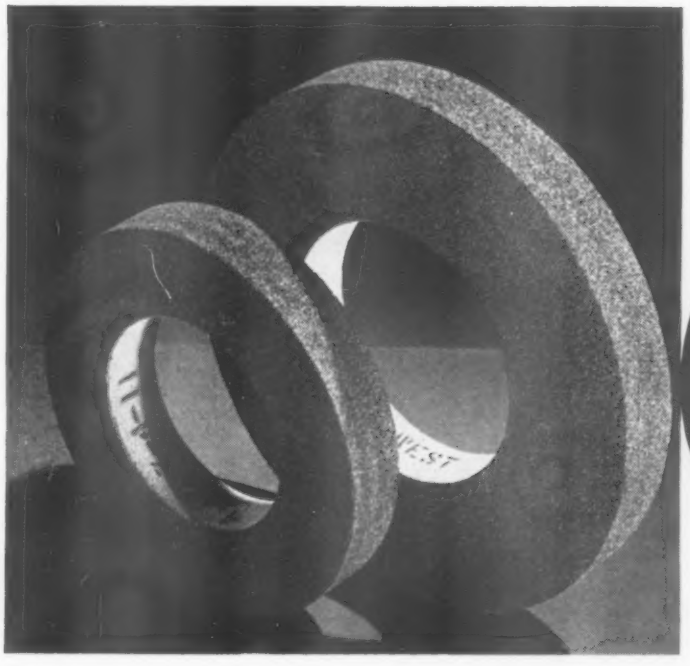

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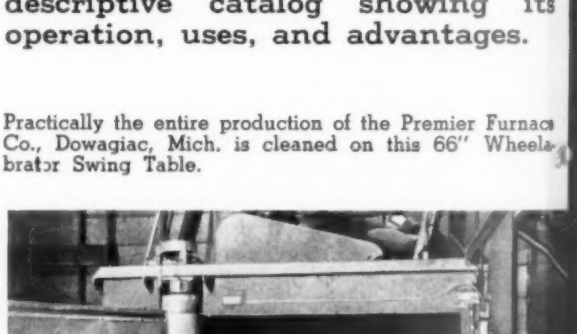
See what the Wheelabrator will do for you. Ask for a demonstration of its cleaning power. Write for a descriptive catalog showing its operation, uses, and advantages.

Practically the entire production of the Premier Furnace Co., Dowagiac, Mich. is cleaned on this 66" Wheelabrator Swing Table.



TYPICAL USERS

Premier Furnace Company	Henry Furnace Company
Cleveland Cooperative Stove Co.	Round Oak Company
General Steel Wares, Ltd.	Prizer-Painter Stove Co.
Leonard and Barker Stove Co.	Detroit-Michigan Stove Co.
Tennessee Stove Works	Brown Stove Works
Atlanta Stove Works	Kalamazoo Stove & Furnace Co.
Marshall Furnace Company	American Stove Co.
Guelph Stove Company	Rudy Furnace Co.

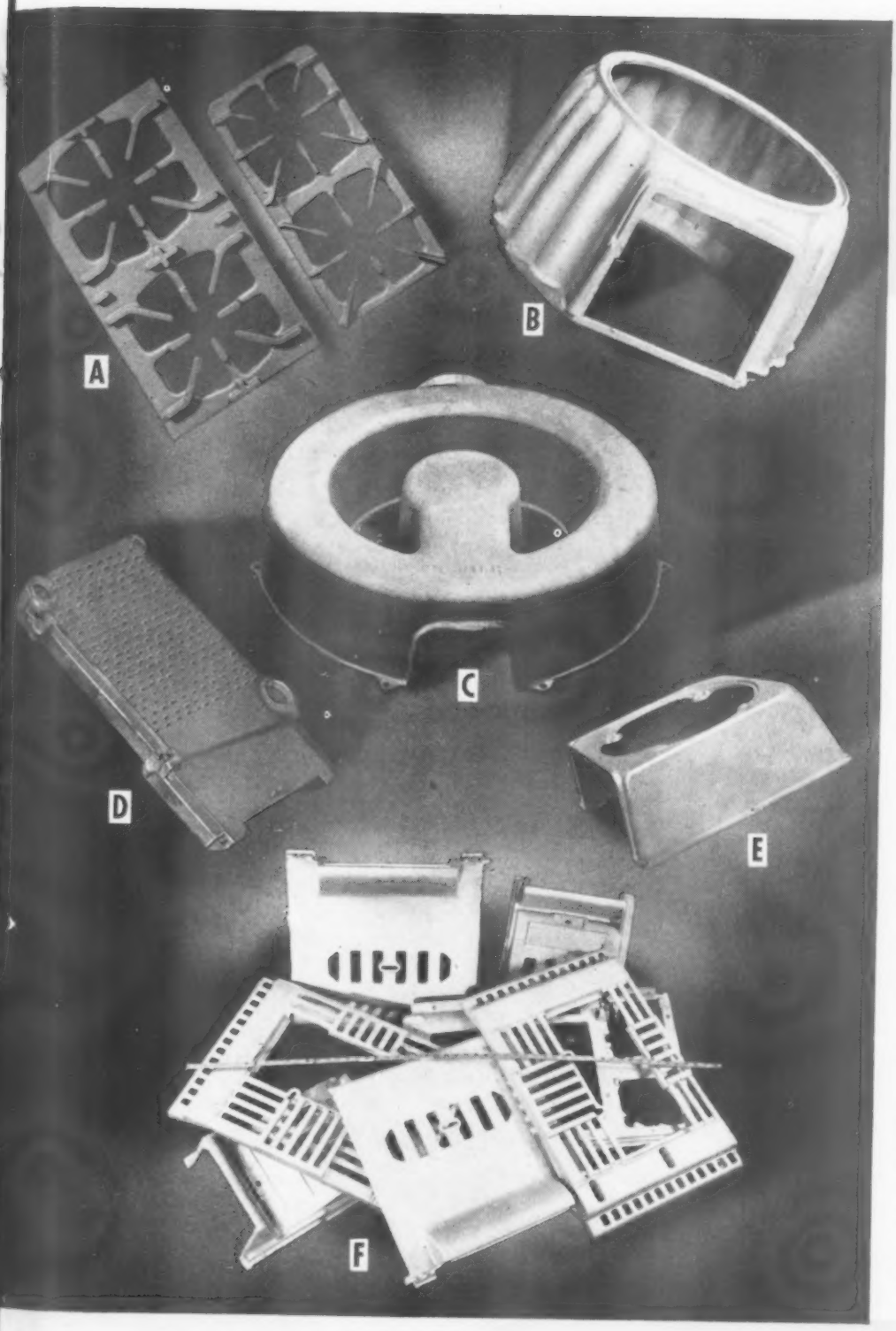
WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

American

WHEELABRATOR & EQUIPMENT CORP.

(FORMERLY AMERICAN FOUNDRY EQUIPMENT CO.)

505 S. Byrkit St., Mishawaka, Indiana



STOVE AND FURNACE CASTINGS BEING WHEELABRATED

Grates
Doors
Panel plates
Feet
Hinges
Latches
Fire pots
Feed sections
Register castings
Boiler fronts
Radiators
Vents
Hot plate frames
Air mixers
Humidifiers
Clean out doors
Grate rings
Ash pits
Ash pans
Shaker handles
Stoker feed screws
Burners
Oil burner castings
Gas stove parts
Stove legs
Stove lids
Brackets
Combustion chambers
Hoods
Bases
Boiler sections

(A) A No. 2 Wheelabrator Multi-Table is used for cleaning Magic Chef gas stove grids prior to enameling at American Stove Co., Cleveland, Ohio. 150 grids are Wheelabrated hourly.

(B) More than 3½ tons of furnace castings including firepots, radiators, grate rings, etc., are cleaned hourly on a No. 4 Wheelabrator Multi-Table at Henry Furnace Co., Medina, Ohio.

(C) A 66" Wheelabrator Swing Table cleans 330 pound furnace radiators at the rate of two minutes a side at Premier Furnace Co., Dowagiac, Mich. Previously only three castings were cleaned in four hours by tumbling.

(D) An Indiana jobbing foundry uses a 66" Wheelabrator Swing Table for cleaning large boiler sections. Cleaning time four minutes.

(E) 10,000 pounds of miscellaneous furnace castings, including ash pits, are Wheelabrated hourly on a No. 4 Wheelabrator Multi-Table at Marshall Furnace Co. Marshall, Mich.

(F) A 10' Plain Wheelabrator Table at a Cleveland stove company cleans stove plate, burners bases, etc. faster than three men can load, unload and turn the work.

(*Continued from page* 100)

F. Barrett, founder of the brass company, taught him the molding trade. In recognition of his 54 years of service with the company, he was presented with a check for over $600, and he and his wife, who were celebrating their 50th wedding anniversary, were given watches. He will continue as a molder.

♦ ♦ ♦

H. B. Fischer, for the last 4½ years manager of the Chicago branch office, Hill & Griffith Co., Cincinnati, has returned to the Oiless Core Binder Co., Cleveland, as general sales manager. Mr. Fischer previously spent 18 years with the latter company, covering the Central states and the Pacific coast, and has had considerable practical and sales experience in the foundry industry.

♦ ♦ ♦

L. H. Billings has been appointed district manager of a newly created sales territory for Falk Corp., Milwaukee, comprising Wisconsin, upper Michigan and parts of Iowa. Mr. Billings, who has been production manager since 1941, joined the company as a co-operative student in 1926. He worked in the engineering and estimating departments for several years and later became advertising manager and manager of the order department. **B. C. Bugbee Jr.,** until recently assistant to the works manager, has been named production control manager. Mr. Bugbee joined the company 5 years ago and spent 3 years as a member of the plant engineering department.

♦ ♦ ♦

Myron Ross, formerly with Jones Foundry Co., Menominee, Mich., has taken a position with inland Gray Iron Foundry Inc., Watertown, Wis.

♦ ♦ ♦

H. K. Clark has been elected executive vice president and a director, the Carborundum Co., Niagara Falls, N. Y., directing plant operations. Mr. Clark was appointed a captain in the Navy during the recent war and still holds that rank as chief of the Navy's Emergency Plants Operations Division. He will be identified with extensive program of plant expansion and modernization affecting Carborundum Co. facilities and plants both in this country and abroad.

Peter C. Valentine Jr., left, who has joined the Del Monte Properties Co. sand department, Del Monte, Calif., as assistant to his father, Peter C. Valentine Sr. The latter has been with Del Monte since 1924, first as a salesman and for the past 17 years as sales manager of the department. Peter Jr. served in the Army Air Corps as a P-47 pilot during the war

♦ ♦ ♦

Clyde E. Williams has been elected president, American Institute of Mining and Metallurgical Engineers. Mr. Williams, a graduate of University of Utah, was appointed assistant director, Battelle Memorial Institute, Columbus, O., when it was founded in 1929, and became its director in 1934. **Andrew Fletcher,** vice president, St. Joseph Lead Co., New York, and **Robert W. Thomas,** general manager, Nevada Consolidated Copper Corp., Ray, Ariz., have been elected vice presidents of the institute. Also elected were the following directors: **Oliver Bowles,** chief, Nonmetallic Economics Division, U. S. Bureau of Mines; **Arthur J. Blair,** chief geologist, Tennessee Coal, Iron & Railroad Co., Birmingham; **William W. Mein Sr.,** president, Calaveras Cement Co., San Francisco; **C. V. Millikan,** chief production engineer, Amerada Petroleum Corp., Tulsa, Okla.; **Earle E. Schumach r,** chief metallurgist, Bell Telephone Laboratories, Murray Hill, N. J.; and **John R. Sumar,** vice president, Standard Oil Co. of New Jersey, New York.

♦ ♦ ♦

William C. Snyder Jr. has resigned as president and director, Continental Foundry & Machine Co., East Chicago, Ind. Mr. Snyder was a vice president and director, Blaw-Knox Co., Pittsburgh, and president and general manager, Lewis Foundry & Machine Division of that organization, prior to being named president of Continental in 1945.

♦ ♦ ♦

Frederick R. Lack, vice president, Western Electric Co., has been elected president of the American Standards Association, succeeding **Henry B. Bryans,** executive vice president, Philadelphia Electric Co. **George H. Taber Jr.,** executive vice president, Sinclair Refining Co., and a director of the society, has been named vice president.

♦ ♦ ♦

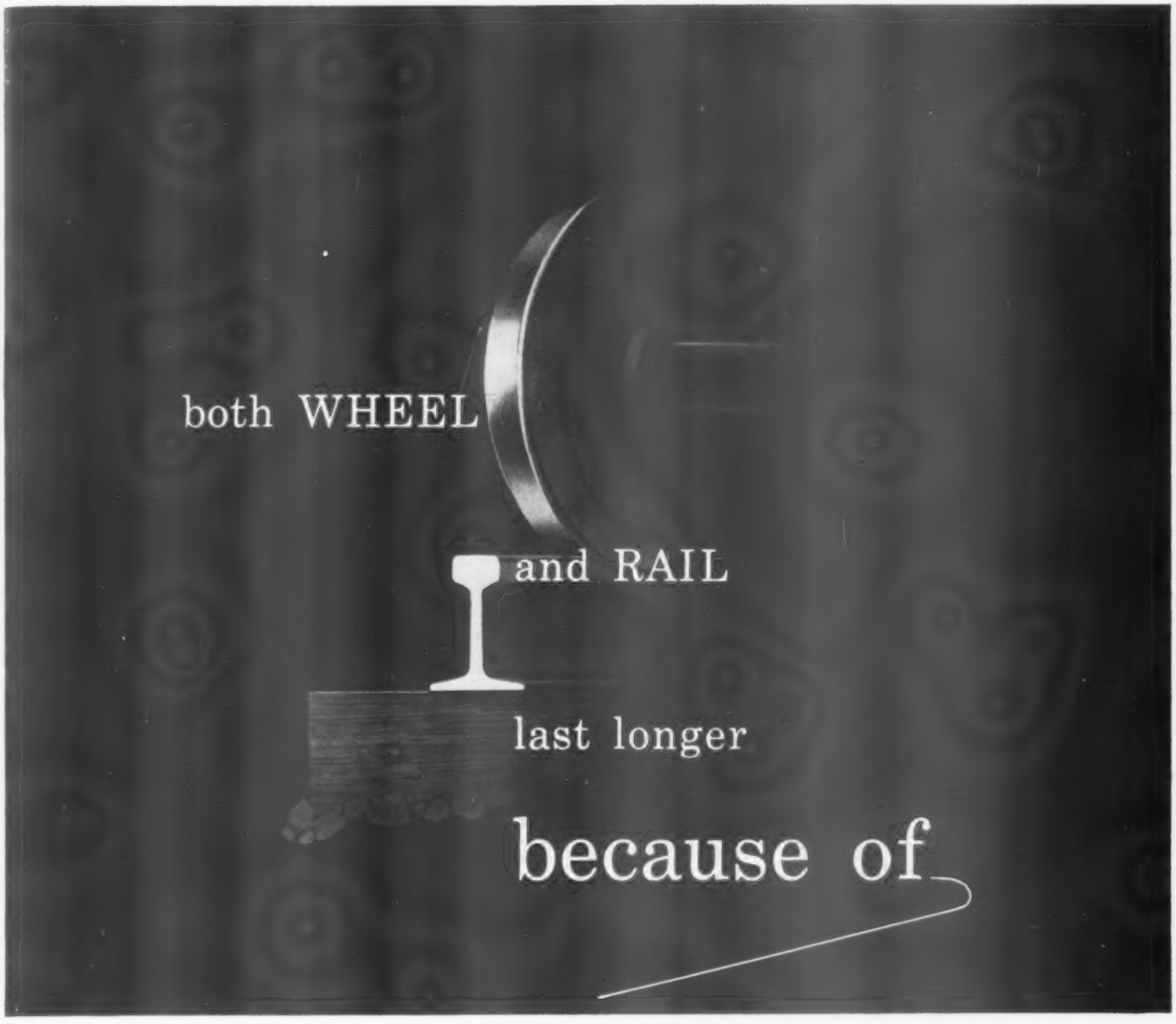
Oliver C. Ralston has been appointed chief of the metallurgical branch of the Bureau of Mines, Washington, and **R. G. Knickerbocker** has been transferred to the position of chief of the Rolla, Mo., division of that branch. Mr. Ralston was made chief of the nonmetallic minerals division in 1943, before creation of the regional divisions, and became assistant chief of the metallurgical branch in 1945. Prior to 1943 he held metallurgical positions with the Bureau at Salt Lake City, Utah, College Park, Md., the New Brunswick Experiment Station, Berkeley,

(*Continued on page* 106)

H. B. FISCHER

B. C. BUGBEE, JR.

L. H. BILLINGS



WHAT MOLYBDENUM DOES FOR STEEL

Thorough tests carried on for many months by one of the most enterprising of American railroads, prove that Molybdenum-alloyed steels give greater wear resistance to rails as well as locomotive wheels and car wheels, and prolong the useful life of both wheel and rail. The Molybdenum addition recommended is small and the resulting improvement is out of all proportion to the slight increase of cost. Detailed information is available.

The Molybdenum Corporation, as a supplier of Molybdenum, Tungsten, Boron, and other alloying materials, welcomes the inquiries of any user.

AMERICAN Production, American Distribution, American Control, Completely Integrated.
Offices: Pittsburgh, New York, Chicago, Cleveland, Detroit, Los Angeles, San Francisco, Seattle.
Sales Representatives: Edgar L. Fink, Detroit; Bromley-Donaldson Co., Los Angeles, San Francisco, Seattle.
Subsidiaries: Cleveland-Tungsten, Inc., Cleveland, O.; General Tungsten Manufacturing Co., Inc., Union City, N. J.
Works: Washington, Pa.; York, Pa.
Mines: Questa, New Mexico; Urad, Colorado.

MOLYBDENUM CORPORATION OF AMERICA
GRANT BUILDING PITTSBURGH, PA.

MCA

JOHN S. CSLAKLOS

Appointed works manager, Hartford Electric Steel Corp., Hartford, Conn., as noted in THE FOUNDRY for December

(*Continued from page* 104)

Calif., and at the Seattle Experiment Station. Mr. Knickerbocker was appointed chief of the metallurgical branch in Washington in 1945, after serving as supervising engineer of the Boulder City, Nev., metallurgical division for 3 years. His transfer to Rolla is at his own request because of his health. Previously he has held Bureau positions at Salt Lake City, Reno, Nev., and College Park, Md.

♦ ♦ ♦

Frank L. Magee, general manager, Aluminum Co. of America, Pittsburgh, also has been made a vice president of the company. Mr. Magee, who will continue in his present duties, joined the company in 1917 as a sales apprentice. His experience with the company has covered both sales and operation. In 1937 he left the district managership of the Atlanta sales office and became manager of sheet sales at Pittsburgh. In 1943 he was made general production manager and assistant to the vice president, **I. W. Wilson,** who is in charge of production. Mr. Magee is a native of Pennsylvania and a graduate of Lehigh University.

♦ ♦ ♦

John G. Fritzinger has been appointed district sales manager of the Philadelphia office, the Carborundum Co., Niagara Falls, N. Y., succeeding **Williard J. Griffith,** who has held that position since 1926. Mr. Fritzinger has been sales engineer for the refractories division of the company in the Philadelphia area since 1924. Mr. Griffith, who joined Carborundum Co. as sales representative in 1912, and **Paul E. Raguse,** since 1937, industrial salesman at Philadelphia, have resigned to form an industrial supply company which will specialize in distribution of Carborundum products in that locality. Mr. Raguse joined the organization in 1926, as sales service engineer.

♦ ♦ ♦

F. K. Platt, Kalamazoo, Mich., has been appointed representative in the southwestern Michigan and northern Indiana area for American Air Filter Co. Inc., Louisville, sharing the post with **Alfred H. Snook,** Wayland, Mich., who has represented the company for a number of years. Mr. Platt, who attended Columbia University, spent 2 years with Consumers Power Co., and 5 years with an elevator company in Battle Creek, Mich., prior to joining American Air Filter Co. 6 years ago as a plant superintendent. For the last 2 years he has been a territorial sales manager in the air filter division.

♦ ♦ ♦

M. S. Cochran has replaced **William McClenon** as purchasing agent at American Foundry Co., 1535 Naomi St., Indianapolis.

♦ ♦ ♦

F. P. Schneider has been elected president and general manager, Velsicol Corp., Chicago, succeeding **Julius Hyman,** executive vice president, who resigned recently. Mr. Schneider has been secretary and treasurer of the company since 1931 when it was founded. Previously he had been in the paper manufacturing and oil refining fields.

F. P. SCHNEIDER

♦ ♦ ♦

George H. Powers has been appointed boron carbide engineer, Norton Co., Worcester, Mass., covering sale and application of its products in the new England territory as well as in New York, Philadelphia, Pittsburgh, and upper New York state, with headquarters at the Worcester plant.

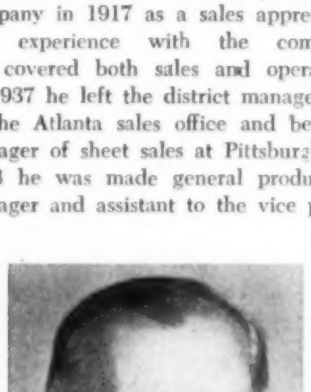
♦ ♦ ♦

John Vickers has resigned as director and general manager, Renfrew Foundries Ltd., Glasgow, Scotland. Mr. Vickers was formerly foundry manager, Rolls-Royce Ltd., Glasgow.

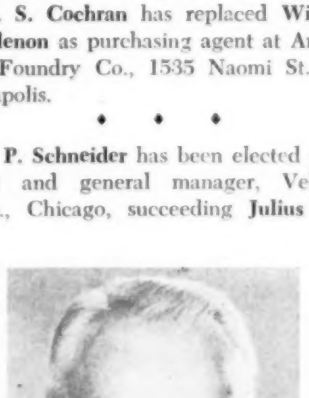
♦ ♦ ♦

Gilbert E. Collyer has been appointed district manager of the Detroit office of H. K. Porter Co. Inc., Pittsburgh.

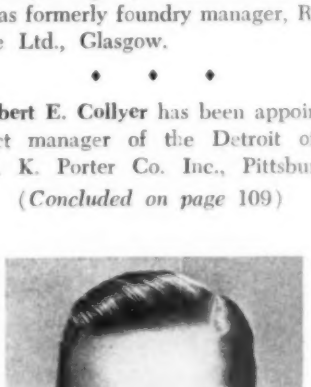
(*Concluded on page* 109)



FRANK L. MAGEE



JOHN G. FRITZINGER



F. K. PLATT

Luxury? You bet it is!

IT MAY NOT SEEM TO BE — **But every time you use a sledge hammer or any manual tool to empty flasks . . . it costs you money! It costs you time! It costs you production! Yes . . . you bet a sledge is a luxury!**

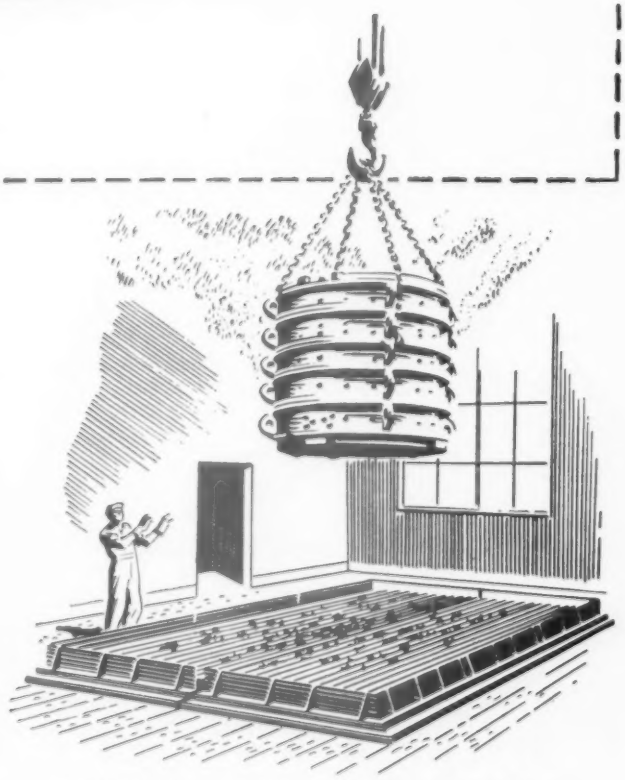
BUT WHEN MULTIPLE FLOATEX SHAKEOUTS ARE PUT TO WORK—

They do your job cheaper. They're "Job-Engineered" to save you man-hours . . . to lower your flask maintenance.

They do your job faster. They shake out loads up to 100 tons in minutes . . . increase your foundry output.

They do your job better. Every inch of multiple Floatex decks is "alive." There are no dead areas to become clogged and ineffective.

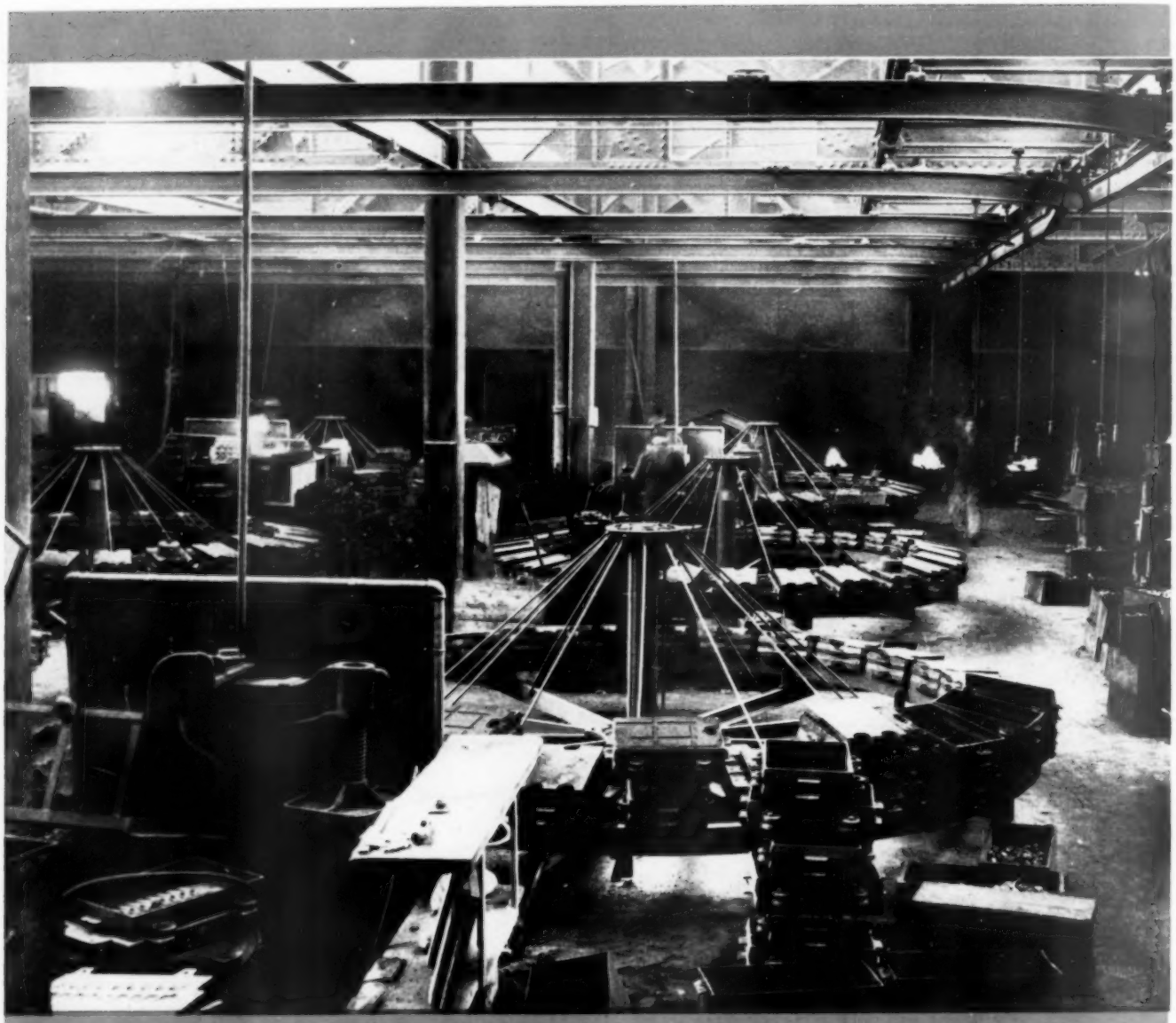
Don't let "sledge hammer" luxury cut *your* profits. Plan now to find out how a Robins multiple Floatex Shakeout can cut your costs.



ROBINS
FLOATEX SHAKEOUTS

"Job-Engineered" to solve your problem
CHEAPER . . . FASTER . . . BETTER

Robins Conveyors Incorporated, Passaic, New Jersey — Division of Hewitt-Robins Incorporated



Complete Installation · · · NINE 14′ ROTO-CAST MACHINES

INSTALLED IN THE MODERN BRASS FOUNDRY OF

H. B. Sherman Manufacturing Co., Battle Creek, Michigan

RUSSEL R. BAISCH— Assistant Works Manager— WRITES AS FOLLOWS:

November 22, 1946

ROTO-CAST
Foundry Equipment, Inc.,
Coldwater, Michigan

Gentlemen:

Since the installation last July of the nine 14-ft. ROTO-CAST Machines in our brass foundry, we have found them to be a highly satisfactory type of foundry equipment.

The ROTO-CAST machine has resulted in more, quality molds, made and poured per shift, and has enabled us to meet the demands of increasingly higher production schedules.

H. B. SHERMAN MFG. CO.
Russel R. Baisch, Assistant Works Mgr.

ROTO-CAST *Foundry Equipment, Inc.*

COLDWATER, MICHIGAN, U. S. A.

WRITE FOR FOLDER "F" FOR FURTHER DETAILS

MECHANIZE YOUR MOLDING FLOOR AT LOW COST

(*Concluded from page* 106)

Mr. Collyer was formerly located in the general sales office at Pittsburgh where he specialized in equipment for the processing industries, locomotives, railway specialties and springs.

♦ ♦ ♦

Charles F. Codrington, assistant to the manager, Allis-Chalmers Mfg. Co., Milwaukee, has been made sales manager of the blower and compressor department, succeeding **A. E. Caudle,** who has resigned. Mr. Codrington, following his graduation from Texas A & M College, joined Allis-Chalmers' graduate training course in 1930. He served in the engine and condenser department for some time before becoming associated with the blower and compressor department in 1935. He has been closely connected with commercial application of turboblowers in a wide range of industrial and chemical process plants.

♦ ♦ ♦

Robert A. Wahl has been appointed sales manager, Union Steel Castings Division, Blaw-Knox Co., Pittsburgh. Mr. Wahl, a graduate of Ohio State University, joined the company in 1937, and has served in a number of purchasing and sales capacities. Prior to that he spent 5 years with other industrial companies.

♦ ♦ ♦

R. D. Houghton has been appointed general manager of the industrial machinery division, Milwaukee Chaplet & Mfg. Co., Milwaukee. Until recently Mr. Houghton was associated with Chain Belt Co., that city, as a specialist in export sale of construction equipment. He has had many years of experience in sales promotion, advertising and export sales development.

♦ ♦ ♦

Herbert L. Whittemore, mechanical engineer, National Bureau of Standards, Washington, has retired, following 29 years of continuous government service. Mr. Whittemore has been chief of the engineering mechanics section since 1918, and is an authority on testing of engineering materials.

♦ ♦ ♦

T. H. Skelton, manager, electric melting, Tropenas steel converting and foundry heat treating departments, Edgar Allen & Co. Ltd., Sheffield, England, has retired. Mr. Skelton became associated with the company in 1901, in the laboratory and in 1905 he took charge of a new Tropenas converter plant, installed in its tramway department foundry. In 1909, when the Edgar Allen organization installed the first Heroult electric arc furnace to be erected in England, he took charge of it. Ten years later he became permanently responsible for production of steel for the company's steel foundry by both electric furnace and Tropenas converter processes. He also took charge of the heat treatment of steel castings. **W. H. Evarard** succeeds Mr. Skelton, but the latter will be available as a consultant to the firm.

♦ ♦ ♦

Henry Hartung, formerly foundry foreman, Oil Equipment Mfg. Co., Louisville, has been appointed foundry superintendent, Moran Flexible Joint Co., Louisville. Mr. Hartung assumed his new post Nov. 1.

♦ ♦ ♦

Gordon Atherton, Ishpeming, Mich., has been appointed foundry superintendent, South Park Foundry & Machine Co., St. Paul, succeeding **Raymond Fisher,** who has moved to Mansfield, O.

♦ ♦ ♦

Harry Temporal has been placed in charge of the recently reopened Chicago office, Farrel-Birmingham Co. Inc., Ansonia, Conn. Mr. Temporal joined Farrel Foundry & Machine Co. in 1910, at Ansonia. He was formerly Chicago office manager, and was also in charge of branch offices in Cleveland and Akron. He served in the sales departments in Ansonia and Buffalo.

♦ ♦ ♦

Homer Parsons has been appointed assistant director of exports, American Brake Shoe Co., 230 Park Ave., New York. Mr. Parsons has had 19 years' experience in the export field and has been a sales representative for Brake Shoe's export department since Aug., 1945. He is a graduate of Fishburne Military School and is a native of Pelham, N. Y.

♦ ♦ ♦

Earl L. Shaner, president, Penton Publishing Co., Cleveland, has been appointed to the Information Committee, Committee for Economic Development, New York. **Fowler McCormick,** chairman of the board, International Harvester Co., Chicago, has been named to CED's research and policy committee.

♦ ♦ ♦

Walter A. Zeis is continuing in the foundry supply and equipment business under his own name, with headquarters at Webster Groves, Mo. Mr. Zeis recently sold his interest in the Midwest Foundry Supply Co., which he formerly operated as a co-partnership with the late **T. C. Hamlin.**

♦ ♦ ♦

Eugene F. Martin has been appointed foundry superintendent, Pioneer Foundry Co. Inc., Jackson, Mich. Previous connections include Dake Engine Co., Grand Haven, Mich., where he was foundry superintendent, and service engineer, Woodruff & Edwards, Elgin, Ill.

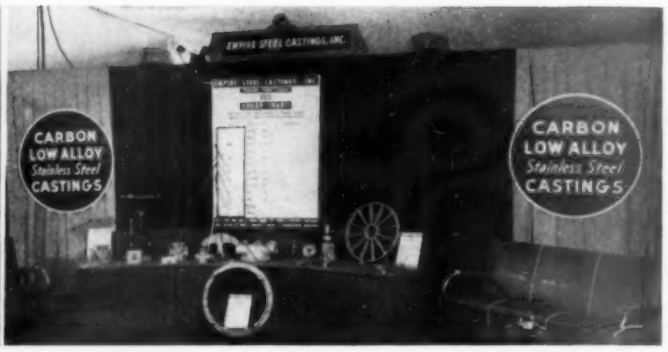
♦ ♦ ♦

Douglas L. Darnell, sales manager of Baker-Raulang Co., Cleveland, has been elected vice president in charge of sales. Mr. Darnell, a graduate of Case School of Applied Science, joined the company in 1919.

CHARLES F. CODRINGTON

ROBERT A. WAHL

R. D. HOUGHTON



CASTINGS DISPLAYED

At National Metal Exposition

EXCELLENT attendance estimated at over 20,000 marked the 28th annual National Metal Congress and Metal Exposition held at Atlantic City, N. J., Nov. 18 to 22. Meeting was sponsored by the American Society of Metals in co-operation with the American Welding Society, the Iron and Steel and Institute of Metals Divisions of the American Institute of Mining and Metallurgical Engineers, and the American Industrial Radium and X-Ray Society. During the week over 50 technical sessions were held by the various organizations. Nearly 400 manufacturers of metallurgical and metalworking products had exhibits and displays covering 250,000 sq ft of floor space at the Municipal Auditorium.

Over a dozen foundries and casting organizations participated in the Metal Exposition with displays of ferrous and nonferrous castings. These included the American Steel Castings Co., Newark, N. J.; Ampco Metal Inc., Milwaukee; Austenal Laboratories Inc., New York; Bergen Precision Castings Inc., Pleasantville, N. Y.; Duraloy Co., Scottdale, Pa.; Empire Steel Castings Inc., Reading, Pa.; Frontier Bronze Corp., Niagara Falls, N. Y.; General Alloys Co., Boston; Malleable Founders' Society, Cleveland; Meehanite Metal Corp., New Rochelle, N. Y.; Michiana Products Corp., Michigan City, Ind.; Michigan Steel Casting Co., Detroit, and J. R. Wood Products Corp., Brooklyn, N. Y.

At the annual meeting of the American Society of Metals held Wednesday morning Nov. 20, A. L. Boegehold, Research Laboratory Division, General Motors Corp., Detroit, received a unanimous ballot for president while Francis B. Foley, Midvale Co., Philadelphia, was elected vice president, and William H. Eisenman was re-elected secretary. Two new trustees elected to serve two years are Arthur E. Focke, Diamond Chain & Mfg. Co., Indianapolis, and John E. Dorn, University of California.

Papers relating to the foundry field which were presented at the technical sessions included "Decarburization During Annealing of Malleable Iron," by H. A. Schwartz and James Hedberg, National Malleable & Steel Castings Co., Cleveland; "Cast Heat Resistant Alloys of the 16 Per Cent Chromium, 35 Per Cent Nickel Type," by Howard S. Avery and Norman A. Matthews, American Brake Shoe Co., Mahwah, N. J.; "Hardness Testing of Metals and Alloys at Elevated Temperatures," by Frederick P. Bens, Climax Molybdenum Co. of Detroit, Michigan; "Mechanical Properties of Cast Low-alloy Steels," by Malcolm F. Hawkes, Carnegie Institute of Technology, Pittsburgh; "Metallurgical and Structural Investigation of Steel Castings for Aircraft," by L. W. Smith and L. D. Morris, Cornell Aeronautical Laboratory, Ithaca, N. Y.; "Effect of Manganese on the Properties of Cast Carbon and Carbon-molybdenum Steels," by N. A. Ziegler, W. L. Meinhart and J. R. Goldsmith, Crane Co., Chicago; "Relation of Quenching Rate and Hardenability to the Mechanical Properties of Several Heat Treated Cast Alloy Steels," by Charles R. Wilks, Howard S. Avery and Earnshaw Cook, American Brake Shoe Co., Mahwah, N. J., and "A Laboratory Study of Quench Cracking in Cast Alloy Steels," by M. C. Udy and M. K. Barnett, Battelle Memorial Institute, Columbus, O.

In addition to the regular technical meetings ASM presented a series of educational lectures in which some papers of interest to foundrymen were given. Those included "Cast Bronze Bushings," by Leighton M. Long, Toledo, O.; "Aluminum Alloy Bearings," by H. Y. Hunsicker, Aluminum Co. of America; "Bronze Backed Bearings," by Bernard J. Esarey, National Bearing Division, American Brake Shoe Co., St. Louis, and "Commercial Cast Aluminum Alloys," by Walter E. Sicha, Aluminum Co. of America, Cleveland. A series of three lectures by Alfred Boyles, U. S. Cast Iron Pipe Co., Burlington, N. J., was devoted to a discussion on the "Structure of Cast Iron". All sessions were well attended.

IF ALL YOUR ALUMINUM CASTINGS AREN'T

Blue Ribbon Babies

The Alcoa Service Engineer can make suggestions and recommendations that will help you cut down rejects, and get more ready-to-ship castings out of your aluminum ingot inventory.

He may suggest minor pattern changes or a different Alcoa Casting Alloy. Or a change in the spotting of gates and risers. Perhaps your melting procedure or foundry techniques can be improved. Aluminum foundry procedure is his business; his advice can help you make your Alcoa Pig and Ingot go further, with fewer rejects and casting repairs.

If you need information or technical help on aluminum casting practices, write to ALUMINUM COMPANY OF AMERICA, 1823 Gulf Bldg., Pittsburgh 19, Penna. Or call the Alcoa sales office nearest you.

MORE people want MORE aluminum for MORE uses than ever

ALCOA FIRST IN **ALUMINUM**

IN EVERY COMMERCIAL FORM

Around DETROIT

By A. H. ALLEN
Detroit Editor
THE FOUNDRY

Automotive model changes deferred as industry seeks to push production to profitable level. . . . Engineers study new design for 8-cylinder engine block

LOOKING back on the first full year of postwar production, the automotive industry finds little cheer in the record. Plagued by strikes in basic industries which kept assembly lines on a stop-and-go basis for nine months of the year, production finally got going in October and maintained a good pace for the last three months. Total car and truck output for the year will figure to about 3,250,000 units, of which about a million were trucks. This is not too bad a showing, all things considered, but it is far from the level which was being planned in the fall of 1945. Limping production resulted in an industry loss of $135 million for the first nine months and except for the cushioning effect of tax carrybacks the financial record for the full year would have been disastrous.

There is a general belt tightening now in process because this year, the industry is "operating on its own money," so to speak, and only by sustained high-level production can further red ink be avoided. It is the fervent hope that about 4,000,000 passenger cars and 1,000,000 trucks can be built in the next twelve months, but if the nation is in for a second round of strikes to enforce 23.5 cents an hour wage increases, such a production accomplishment is just fanciful.

The next few weeks should see the introduction of a few restyled 1947 models. Changes will be minor in character and some which had been planned may be abandoned in view of the increasing pessimism over all new model programs. As long as demand holds for new cars there does not appear much point to spending money for new tooling. General Motors, for example, has canceled outright a program for new tools and dies on one line of bodies scheduled for introduction this fall. Much of the work had been completed at a cost running into the millions, but it was washed out completely, with patterns pulled out of foundries, work halted in tool and die shops and even finished dies sold for scrap. Thus Fisher Body a few weeks ago in one plant alone sold 2500 tons of new dies, some ranging up to 50,000 pounds in weight, before they had ever been put in a press for a tryout.

It is not believed that GM suspended its entire 1948 model program, yet the scrapping of millions of dollars worth of tools is nothing to be taken lightly. Decisions of this sort indicate the corporation management is viewing the future with considerable alarm and is inclined to make retrenchments accordingly. The action is bound to be reflected in unemployment in tool and die shops, possibly in gray iron foundries producing such dies as well.

° ° °

Foundries were in a sweat last month when the continuing coal strike and freight embargo threatened to shut off shipments of coke, sand and other bulk materials. Some plants had cut operations to two or three days a week. One malleable foundry in Detroit suspended operations entirely. Others were figuring out expedients to keep production going, such as mixing kerosene with green sand to make it the equivalent of dry sand, etc. The sudden capitulation of Lewis, however, relieved the emergency and production resumed without forcing any reduction in automobile assemblies. Loss of 1,500,000 ingot tons of steel production certainly will be felt eventually, probably forcing a delay in stepping up assemblies this spring.

° ° °

The first national conference of UAW-CIO foundry workers convened in Milwaukee Dec. 7 and 8, with about 200 delegates from 100 foundries in 22 states present. Main purpose of the conference was stated to be the working out of a program dealing with wages, hours, wage differentials, health and safety problems. Beyond some official blasts issued by the international union office, little seems to have come out of the conference.

A resolution was passed in connection with racial discrimination, recommending the following: (1) More adequate opportunities for so-called minority group members to work and participate in the affairs of the union on the international level; (2) insistence on no-discrimination clauses covering the question of hiring and the terms and conditions of employment, and the observance of such clauses in all agreements; (3) stricter accountability by local union officials on every reported case of alleged racial, religious or nationality discrimination; and (4) an antidiscrimination publicity campaign, featured by mass meetings, picketing and civil rights suits in behalf of UAW members in all sections of the country.

° ° °

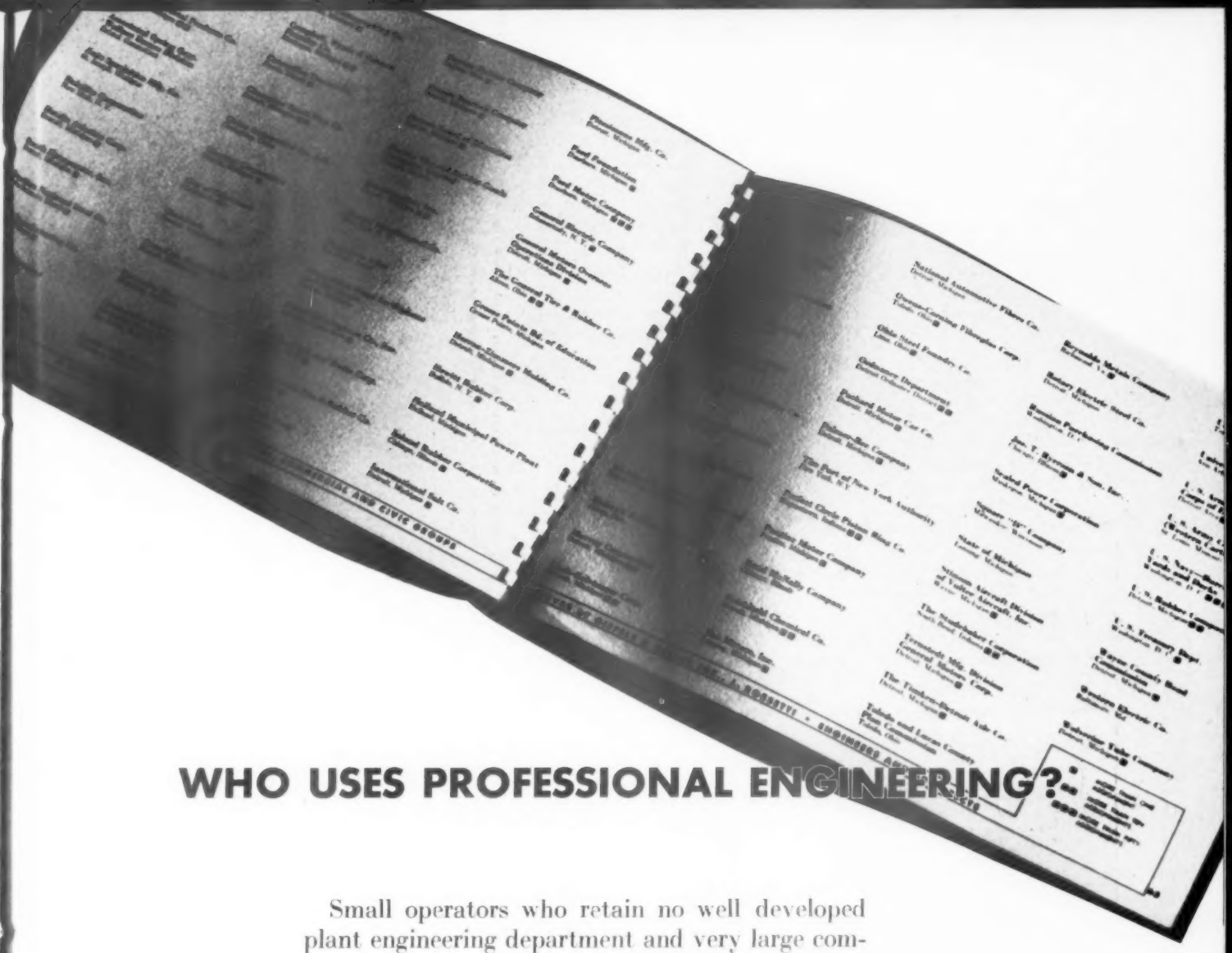
In the field of automotive engine development some interesting work is going on with the straight-eight type of block. The 8-cylinder engine is liked for its smoothness and overall efficiency, the principal objection being that its length and the length of the crankshaft required has a tendency to produce a whipping action in the shaft. Hence it has been proposed that instead of locating the cylinders in line they be brought closer together by staggering every other cylinder, making a group of four on one side of the block and four on the other. This in effect would amount to going part way toward the V-8 design, but still keeping all cylinders in the same block, permitting a reduction of several inches in the length of the block and increasing its width slightly. Buick, Pontiac, Olds, Chrysler and Packard all have 8-cylinder engines of the in-line type. It is not known whether staggering the cylinders in this way would necessitate angling the bore or not; probably it would.

Hudson reportedly has changed specifications for its cylinder heads, switching from gray iron to cast aluminum. One of the problems encountered with the aluminum cylinder head—more serious in certain sections of the country than in others depend upon the character of the water supply—is galvanic action between the aluminum and the steel studs holding it to the block. It would appear the difficulty might be licked by using studs of suitable stainless steel analysis to minimize galvanic action.

° ° °

An automotive buyer reports it is becoming a little easier to place gray iron castings business, with foundries now coming to the buyer occasionally instead of the buyer having to ferret out castings sources. This will be an interesting trend to watch, since it appears to signal the end of one phase of the sellers' market. Foundrymen can only hope it does not also forecast the gradual return of the old practices of cutting

(*Concluded on page* 114)



WHO USES PROFESSIONAL ENGINEERING?

Small operators who retain no well developed plant engineering department and very large companies whose engineering departments employ hundreds of technicians—a cross section shows organizations of all sizes in all industries employing GIFFELS & VALLET, INC., to aid them in developing new and modernized facilities.

An executive planning new developments may supplement his own engineering department for the specific occasion. He will conserve his own time as well as that of his key personnel and will profit from the use of experienced engineers whose viewpoints are new.

GIFFELS & VALLET, INC.

INDUSTRIAL ENGINEERING DIVISION
1000 MARQUETTE BUILDING, DETROIT

(*Concluded from page* 112)

prices to get tonnage with the consequent undue pressure on smaller plants and all its disastrous wake.

This year probably will see increasing pressure on managers of the production gray iron shops to force down their scrap percentage. Generally speaking, scrap has moved up appreciably in the past year over what it has been normally, mainly because of inability to obtain coke and pig iron of uniform quality. However, the demands of the assembly line have made it necessary to put up with high scrap since it has not been a question of insisting upon uniformity in coke and pig iron but rather "ship us some whatever the analysis."

Plans for the new plant of General Motors Central Foundry Division at Defiance, O., have been held in abeyance and equipment orders deferred. Reasoning behind the move apparently is that extension of gray iron capacity at present would be unwarranted since it is impossible to obtain sufficient raw materials to keep present foundries operating at capacity, and on top of that the new gray iron plant at Danville, Ill., shortly will be melting. Belief is held in some quarters that the Defiance project may be on the shelf for good; at least it will be there until the current wage-price uncertainty has cleared.

• • •

Following excerpts are from a letter to the writer of this page from Leon B. Thomas, now superintendent of foundries for Sucesores de Abarca Inc., San Juan, Puerto Rico. He was at one time assistant to the general manager for Campbell, Wyant & Cannon Foundry Co. in Muskegon, later foundry manager for Wilson Foundry & Machine Co., Pontiac, and for five months a consultant on special assignment at foundries of Ford Motor Co. River Rouge plant. He writes:

"This company has gray iron, brass and steel foundries. Principal product is castings for sugar refining equipment —large rolls, evaporators, condensers, elbows, pipe, etc., which go to make a modern sugar mill. Some of the castings are large ones, weighing up to 18 tons, and are completely machined here in our own machine shop. . . . Prices are high here (eggs 96 cents a dozen) and there are no apartments or houses to rent. If there were any the prices they ask are as high as in the States."

• • •

Harry B. Swan has retired as foundry superintendent of Cadillac Motor Car Division, after 35 years of service. He was tendered a farewell banquet by his associates in November and was presented with a briefcase as a memento of the occasion. He started with the old Leland & Faulkner foundry on Detroit's east side in 1911 as a coremaker and continued with the organization after it was consolidated with Cadillac and moved to the present location on Clark street. He has long been one of the best known executives in the automotive foundry field.

CASTINGS BY AIR: Ace Foundry Ltd., Huntington Park, Calif., was one of the first customers to receive delivery of a civilian airplane when North American Aviation Inc., began delivery of its new ships recently. The foundry plans to use the plane for quick shipment of castings to its customers. Shown with the airplane, left to right, are: E. G. Gaskell, treasurer; H. L. DeSantis, secretary; John DeSantis, sales manager, who will be the company pilot, and W. A. DeSantis, president

Lectures To Cover Foundry Practice

Chicago Chapter of the American Foundrymen's Association is conducting a series of six lectures covering the fundamentals of foundry practice. These lectures, to be presented by outstanding foundrymen, metallurgists and foundry engineers, will start Jan. 8 and end March 19. All of the lectures will be given in the Peoples Gas Building auditorium, 122 South Michigan Ave., Chicago.

The lecture schedule follows:

Lecture 1—Wednesday, Jan. 8.
Subject—"What Do We Know About Sand?"
Technical chairman, L. E. Taylor, Illinois Clay Products Co. Speaker, J. B. Caine, Sawbrook Steel Castings Co., Cincinnati.

Lecture 2—Wednesday, Jan. 22.
Subject—"Patterns."
Technical chairman, H. K. Swanson, Swanson Pattern & Model Works. Speaker, Leonard F. Tucker, City Pattern Works, South Bend, Ind.

Lecture 3—Wednesday, Feb. 5.
Subject—"Gating and Risering."—A panel session.
Technical chairman, R. P. Schauss, National Malleable & Steel Castings Co. Speakers: Malleable Practice—Kenny Smith, Chicago Malleable Castings Co.; Steel Practice—John Rassenfoss, American Steel Foundries; Nonferrous Practice—W. B. George, R. Lavin & Sons Inc.; Gray Iron Practice—John Woodell, Hansell-Elcock Co.

Lecture 4—Wednesday, Feb. 19.
Subject—"Casting Defects."
Technical chairman, John Rassenfoss, American Steel Foundries. Speaker, W. A. Hambley, Falls Mfg. Co., Menomonee Falls, Wis.

Lecture 5—Wednesday, Mar. 5.
Subject—"Centrifugal Casting."
Technical chairman, J. F. Lange, Carnegie Illinois Steel Corp. Speaker—John Perkins, Ford Motor Co. of Canada, Windsor, Ont.

Lecture 6—Wednesday, Mar. 19.
Subject—"Cores—Sands and Binders."
Technical Chairman, R. A. Witschey, A. P. Green Fire Brick Co. Speaker, O. S. Myers, Werner G. Smith Co., Cleveland.

Q: Which film is first choice for fast gamma-ray inspection of heavy castings?

A: Kodak's Type K

Internal appearance of casting in area of weld repair.

He took no chances—this manufacturer . . . Using radiography, he found that this cast-steel elbow was imperfect, but that it could be repaired. Then he determined the soundness of the repair weld by using radiography again.

What film did he use? . . . Kodak Industrial X-ray Film, Type K, of course. Why? Because Kodak's Type K . . . the fastest of all gamma and x-ray films . . . enabled him, in the shortest possible time, to see the internal structure of this heavy casting with sufficient detail.

Radiography more than pays its way . . . In foundry operations, with radiographic evidence, you can quickly prove the effectiveness of new casting technics without expensive drawn-out pilot runs . . . screen out faulty castings *before* costly machining starts. For more information about production efficiencies and economies that radiography makes possible, see your local x-ray dealer, or write:

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Radiography

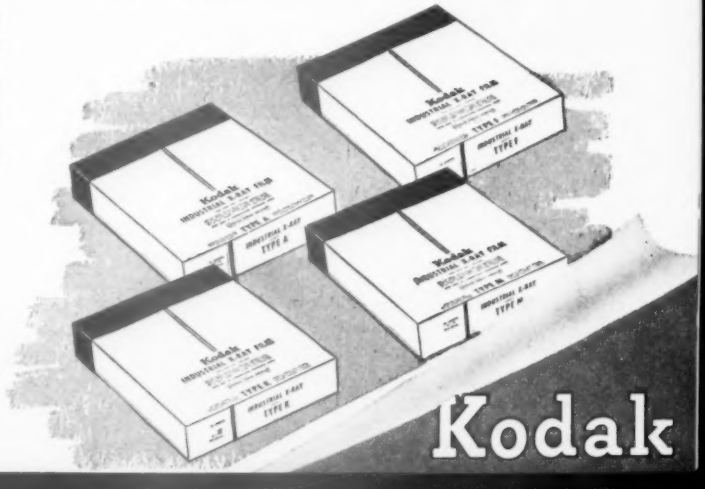
. . . another important function of photography

Other Kodak Industrial X-ray Films

Type A . . . for gamma-ray work in sections where finer film grain and higher contrast are desirable for maximum sensitivity at moderate exposure times.

Type F . . . for use with calcium tungstate screens. Primarily for x-raying heavy steel parts, where only moderate voltage x-ray equipment is available. Radiography at its fastest!

Type M . . . first choice in critical inspection of light alloys or in the examination of thin steel at moderate voltages and heavy alloy parts with million-volt equipment.



Kodak

Foundry Developments

By EDWIN BREMER

FOUNDRYMEN from time immemorial have facetiously remarked to the uninitiated that certain defects in castings might have been caused by rodents dragging their tails along the mold face or that what now are more popularly known as "gremlins" had been busy in the mold cavity. But the accolade goes to a South African foundryman who offered "proof positive" that defective castings can be caused by other than the metal, molding material and the human element.

The story appears in the October issue of *Engineer and Foundryman*, published in Johannesburg, South Africa, and relates to a meeting of the South African Branch of the British Institute of Foundrymen at which foundry problems were discussed. One of the members showed some "rotten" castings containing protrusions, holes and rough patches in no definite pattern, and asked other members as to the cause—remarking that the molds stood overnight before pouring. With that one member suggested that ants or some other insects might have ravaged the molds. Thereupon, the member submitting the castings stated that the trouble was caused by certain grayish-black beetles, which were very prevalent in the Transvaal at the time, entering the molds during the night and excavating in no uncertain manner. A visitor to the meeting stated that he had seen the same effect caused by crickets in an Egyptian foundry operated by the Allied forces during the war.

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PRESENCE of iron in bronze and brass used for magnetic instruments indirectly causes improper functioning of the instruments, according to five reports now on sale by the Office of Technical Service, Department of Commerce, Washington 25. Magnetic properties of the alloys were found to be affected by the form in which the iron was present, not directly by the iron itself. Other factors, apart from iron content, which affect the magnetic qualities are casting conditions, segregation, aging, size and shape. Reports are PB-16767 (photostat $3; microfilm 50 cents) on inaccurate functioning of instruments of copper alloys; PB-16740 (photostat $5; microfilm $1) on effect of iron impurity on susceptibility and magnetic moments of one type of brass and two of bronze; PB-16469 (photostat $4; microfilm $1) similar study on bronze casting alloy and brass used for plates and sheets; PB-16468 (photostat $5; microfilm $1) studies on a brass of relatively high zinc content and a phosphor bronze. Similar data are given for a number of aluminum alloys. PB-16425 (photostat $9; microfilm $1.50) on results of an investigation of ten copper-base alloys, not including those discussed in other reports.

• • •

WHILE the use of electrical instruments for measuring the moisture content of molding sands is not new, an article in the Nov. 14 issue of the *Foundry Trade Journal* describes a comparatively simple and compact unit for that purpose. Unit consists of a millivolt meter, 3-v dry battery and several fixed and variable resistances contained in a box 4½ x 7 in. and 5 in. deep. Contact plates for sand are two steel plates 3½ in. long, 1½ in. deep on the bottom of the box, and spaced 1⅜ in. apart.

• • •

SECOND report pertaining to the basic-lined cupola presented at the annual meeting of the Institute of British Foundrymen indicates that appreciable desulphurization can be obtained simultaneously with dephosphorization. With high steel charges there is no difficulty in producing conditions under which phosphorus may be removed, but with that type of charge there is a serious danger that such conditions will result in metal unsuitable for further processing. However, the subcommittee which carried on the investigation believes that with further opportunities for experiment a commercial process might be developed for dephosphorization.

• • •

FOUNDRIES which employ molten salt bath treatment should obtain and study carefully a research report recently issued by the National Board of Fire Underwriters. Entitled "Potential Hazards in Molten Salt Baths for Heat Treatment of Metals" it discusses various hazards, causes of accidents and precautions recommended. Copies of the report may be secured from the organization at any of the following addresses: 85 John St., New York; 222 West Adams St., Chicago, and 1014 Merchants Exchange Bldg., San Francisco.

• • •

COMPREHENSIVE data on low-temperature properties of ferrous and nonferrous alloys, based on information available as of September 1941, are contained in a 591-page, 7-volume report available from the Office of Technical Services, Department of Commerce, Washington 25 (PB-19793; photostat $40; microfilm $6). The data were compiled by A. E. White and C. A. Sibert, University of Michigan, under a wartime contract with the National Defense Research Committee. Some of the authors' conclusions are:

Physical properties of nonferrous materials at room temperature either are maintained or improved at subzero temperatures. Ferrous materials, increase in hardness, tensile strength and yield point at subzero temperatures, but show a decrease in value for reduction of area, elongation and impact resistance. Transition temperature from a tough to brittle type of fracture is not constant with alloys of the same type and varies even with materials of substantially the same composition. Among the factors which appear to affect the transition temperature are grain size, carbide size and distribution, size and distribution of nonmetallic particles, sample size and type of notch, and type of impact testing machine.

Most outstanding element which aids in maintaining good impact resistance at low temperature is nickel. Copper is beneficial, but not so satisfactory as nickel. In general it appears that any element which will form a solid solution when combined with ferrite tends to improve low-temperature resistance, while any carbide forming element in the presence of substantial amounts of carbon, tends to decrease low-temperature impact resistance.

• • •

GOGGLE fogging in cold weather is a common occurrence, but it is claimed that the fogging can be prevented by use of ordinary yellow laundry soap. Take a sliver of the soap and rub it lightly over the inside of the lens and then polish thoroughly. With proper polishing, the soap will not cause any reduction in vision or distortion, but will keep the inside of the lens clear.

• • •

WITH a view to obtaining a stirring action in the metal bath similar to that associated with the induction type units, it is reported that an arc furnace is being built in Sweden incorporating a wire-wound magnet to gain the benefit of magneto-strictive effect.

LET THIS BE HEARD
BY ALL FOUNDRYMEN
EVERYWHERE . . . . .
CROWN HILL
MEANS
Quality Seacoal
THE FEDERAL FOUNDRY SUPPLY COMPANY
4600 East 71st Street • Cleveland 5, Ohio
Seacoal Plant
CROWN HILL, W. VA. • CHICAGO • CHATTANOOGA, TENN. • DETROIT • MILWAUKEE • NEW YORK • ST. LOUIS • RICHMOND, VA. • Mines UPTON, WYO.
IN TWIN CITIES: The Foundry Supply Co., Inc., 2295 University Ave., St. Paul 4, Minn. IN SOUTHWEST: Beaumont Cement Sales Co., Houston & Beaumont, Texas, and Harvey, La.

SELLS FOUNDRY INDUSTRY

As Good Place To Work

IN KEEPING with the slogan, "A foundry is a good place to work," the Belle City Malleable Iron Co., Racine Wis., conducted an advertising campaign last summer and fall for the purpose of selling the advantages of foundry employment to the people of its community. The series of three 8 x 11-in. advertisements, published in the *Racine Journal Times* and reproduced here in miniature, also served the purpose of counteracting in some measure the poor impression many people have of foundries as places of employment.

First advertisement in the series was entitled "The Foundry Isn't What It Used to Be," and pointed out that much of the heavy work has been mechanized, that many of the hot and dusty jobs have been made automatic and put under cover and that the ventilation and smoke removal are better. Further, that these changes make working conditions on a par with those of any metalworking industry in Racine.

The second advertisement, "They Wouldn't Stay 20 to 50 Years Unless They Liked It," told about the 121 employees at Belle City Malleable with over 20 years service, including ten with more than 40 years service and one over 50 years. It was pointed out that these old-timers would not have stayed if they didn't like the work, their fellow workers, relations with the management and conditions of work.

Number three stated, "Knowledge of a Basic Industry Is a Good Foundation In Any Work." Castings are the starting point, the basic material, for a great many manufactured products. A knowledge of how they are made will be of help not only in the foundry but in other trades. Learning the foundry business from beginning to end is constructive and interesting and affords good training in careful, methodical habits of work that leave nothing to chance.

The fact that foundry work is not a white collar job is not ducked. The advertisement states that all metal-working trades require men who are not afraid to work, or get their hands dirty; and, says the advertisement, a man interested in his future doesn't stop for that.

All the advertisements extended an invitation to persons interested in working in the foundry to visit the plant in a personally conducted tour, and to see the newly opened service building with cafeteria, rest rooms, etc.

In addition to the newspaper advertisements a series of folders are being sent to customers and prospective customers of Racine Steel Castings Co., division of Belle City Malleable. They, too, present a new approach to the promotion of castings.

Folder No. 1 tells the story of transition from war to peace and the important part quality castings play in the manufacture of modern equipment.

The second folder tells how this foundry insures that the customer's castings specification for physical properties and dimensional accuracy are insured for each casting in every shipment. The pattern checking service is described. A test casting is poured before production starts with any new pattern. X-ray, complete layout checks and other inspections for this test casting are outlined. The closeness of control over production, and finally, the work of inspectors under instructions on the customers requirements from the sales department are described.

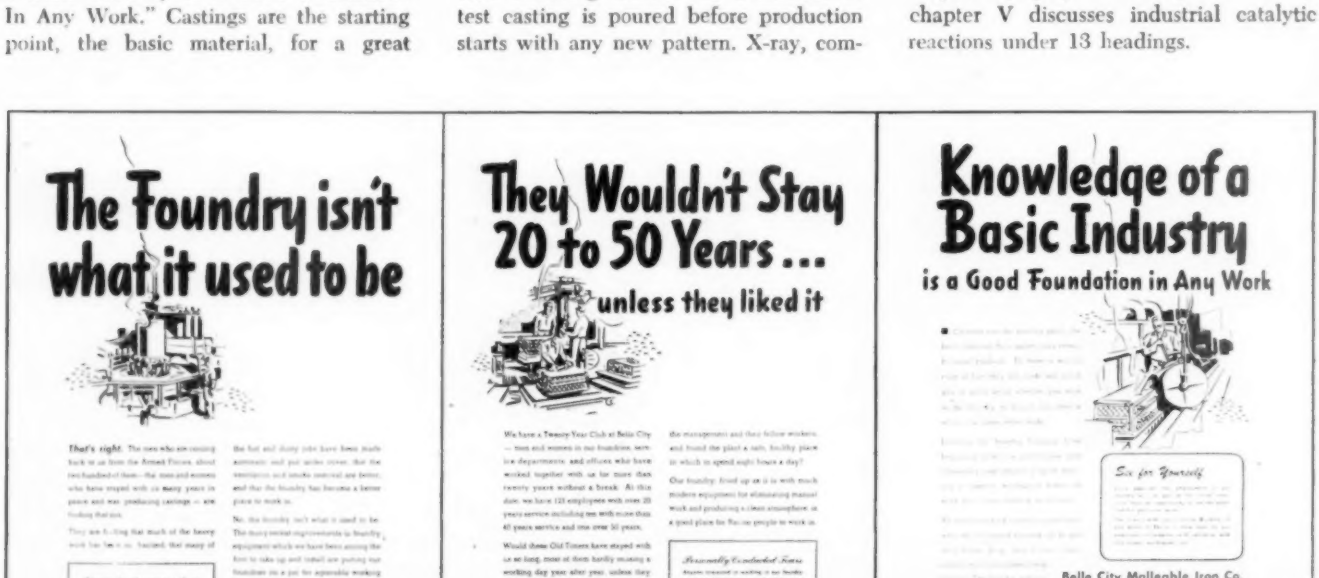
The campaign is an indication of the fresh, new approach that foundries can take toward selling both their industry and their products.

Book Review

Catalytic Chemistry, by H. W. Lohse, cloth, 471 pages, 5½ x 8½ in., published by Chemical Publishing Co. Inc., Brooklyn, N. Y.

Catalytic phenomena and catalytic reactions play an important part in modern industrial processing, and the author presents a brief factual presentation of the underlying principles with the aim of giving the chemist with an elementary training a concrete idea of what catalytic chemistry is and its working principles. Following an introduction the author gives a brief history of catalytic chemistry in chapter I, while in chapter II catalytic theory is discussed under 18 headings such as chemical composition, spectroscopic methods, surface reactions, etc.

Nature and properties of catalysts are examined in chapter III; the various elements being divided according to the periodic family groupings. Chapter IV is concerned with specific types of catalytic reactions which are described under 18 headings such as oxidation, dehydrogenation, cyclization, esterification, alkylation, polymerization, etc. Final chapter V discusses industrial catalytic reactions under 13 headings.


The Foundry isn't what it used to be
Belle City Malleable Iron Co.
Racine Steel Castings Co.
They Wouldn't Stay 20 to 50 Years...
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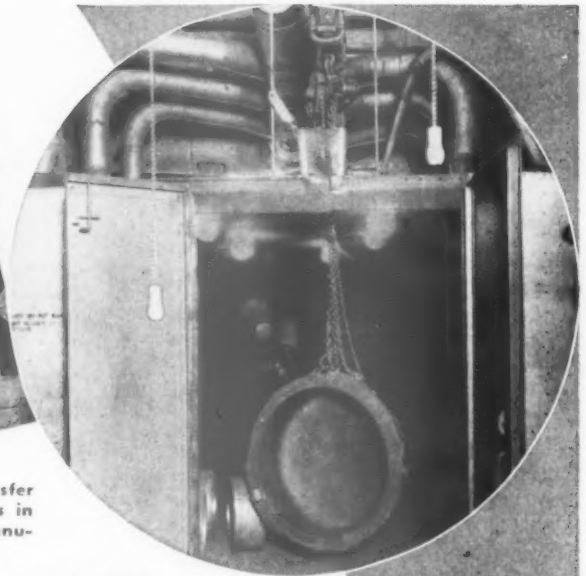
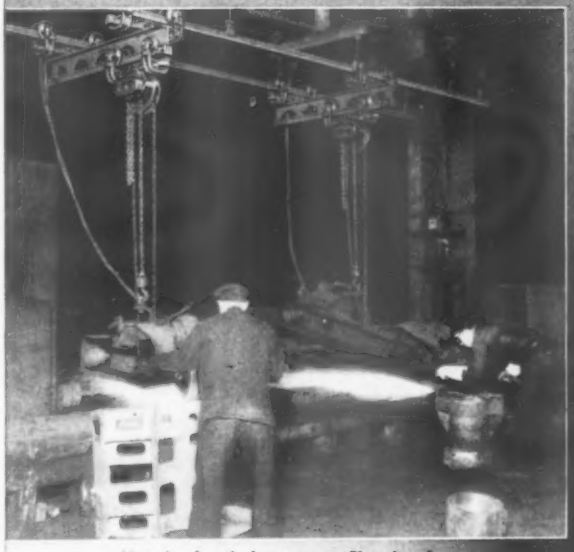
Racine Steel Castings Co.
Knowledge of a Basic Industry
is a Good Foundation in Any Work
Belle City Malleable Iron Co.
Racine Steel Castings Company
Forest and Kewaunee Streets Racine

Hand-propelled transfer bridges with electric hoists in Cleaning Department of large lathe manufacturer.



Heavy castings are carried into chamber and supported on overhead tramrail during blast cleaning.

OVERHEAD EQUIPMENT *Operates Smoothly in* Abrasive Plants



Hundreds of short-span Cleveland Tramrail cranes are handling swing grinders in many plants.

In the cleaning departments where castings, forgings, billets, etc., are ground and blasted, will be found convincing proof of the design, workmanship and quality built into every piece of Cleveland Tramrail equipment. Here also is demonstrated the inherent correctness of locating materials handling facilities above and away from the floor where dust conditions are worst.

Despite blasting, piercing storms of grit, and atmospheres churning with penetrating abrasive dust, the equipment continues smooth and easy in operation — even after years of continuous service.

Dozens of Cleveland Tramrail installations are serving successfully the tough cleaning jobs of industry.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3801 EAST 283RD ST. WICKLIFFE, OHIO.

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

PLAN FOR 1947 AFA CONVENTION

(*Concluded from page* 93)

housing bureau beginning Feb. 15, and all member applications for hotel space then in its hands will receive first consideration, as of that date.

In reflection of the new peak level of association membership, attendance at the Detroit convention is expected to establish a new high mark for a nonexhibit meeting. AFA officials have been assured, however, that, despite the new attendance record prospect, housing will be entirely adequate. In their letters of invitation to the association, the Detroit Hotel Association and the Detroit Convention and Tourist Bureau stressed that every arrangement will be made to "assure the convention a clear field and ample hotel accommodations."

All first day sessions of the convention, including, tentatively, all committee meetings scheduled for that day, will be held in the Rackham Memorial, which affords unusually excellent meeting accommodations. The opening session, to be staged there, is planned as a luncheon, featured by the address of an outstanding industrialist and the attendance of city officials, educational leaders and the officers of Detroit organizations.

Hotels Book-Cadillac and Statler have been designated joint headquarters for the 1947 meeting and present plans are for dual registration facilities. Beginning Tuesday, Apr. 29, all sessions and group meetings will shift to Detroit hotels for remaining days of the congress.

Among the group meetings tentatively on the Apr. 29 program are the Canadian luncheon and the Chapter Officers' dinner. The association's annual business meeting and lecture is scheduled for 10 a.m., Wednesday, Apr. 30, and the annual Alumni dinner is on the program for that evening. Climax session of the convention, the annual AFA banquet, will be held at 7 p.m., Thursday, May 1. The principal speaker has not been announced.

Under a procedure agreed to by the association's divisional executive committees, all papers to be presented at the technical and other sessions of the 1947 convention are to be in AFA headquarters for preprinting in the near future. If the schedule is adhered to, every attempt will be made to preprint and distribute all Detroit convention papers at least 30 days prior to their presentation. Wide advance distribution of the papers scheduled for the meeting will stimulate, it is believed, the general discussion that AFA committees are seeking for every convention subject. Many sessions, however, will remain of the round-table type and will be, consequently, informal.

(Courtesy *Collier's* and Jeff Keate)

"We've had so many strikes and layoffs at the foundry, lady, I had to take any kind of job to hold body and soul together"

AFA Appoints Brass, Bronze Committee

D. Frank O'Connor, foundry superintendent, American Saw Mill Machine Co., Hackettstown, N. J., has been appointed chairman of the 1946-47 brass and bronze division executive committee, American Foundrymen's Association. Walter W. Edens, foundry superintendent, Ampco Metal Inc., Milwaukee, is vice chairman and Joseph E. Foster, AFA, Chicago, secretary.

Other members are: W. M. Ball Jr., superintendent, Magnus Brass Division, National Lead Co., Cincinnati; W. B. George, metallurgist and foundry engineer, R. Lavin & Sons Inc., Chicago; E. W. Horlebein, president, Gibson & Kirk Co., Baltimore, and a national AFA director; B. M. Loring, senior metallurgist, U. S. Naval Research Laboratory, Washington; B. A. Miller, superintendent of foundries, Baldwin Locomotive Works, Philadelphia and H. M. St. John, superintendent, Crane Co., Chicago.

Book Review

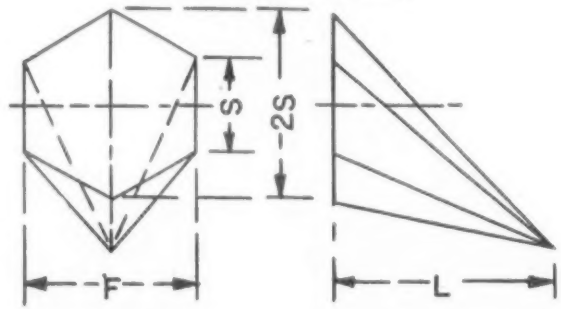
Collected Papers on Metallurgical Analysis by the Spectrograph, **edited by D. M. Smith, Cloth, 162 pages, 6⅛ x 9⅝ in., published by the British Non-Ferrous Metals Research Association, Euston street, London N. W. 1, England. Price 21s.**

This volume contains a selection of 13 papers based on various reports submitted by the Sub-committee on Metallurgical Applications of the Spectrograph of the British Non-Ferrous Metals Research Association to the membership. Two of the papers deal with processing and calibration of photographic plates; four on analysis of aluminum and aluminum alloys; three on lead and lead alloys; two on copper alloys; one on zinc alloys; and one on platinum. The book is not a systematic treatise on the spectrographic analysis of metals and alloys, but many of the papers make practical recommendations on various aspects of technique.

THE FOUNDRY DATA SHEET JANUARY, 1947

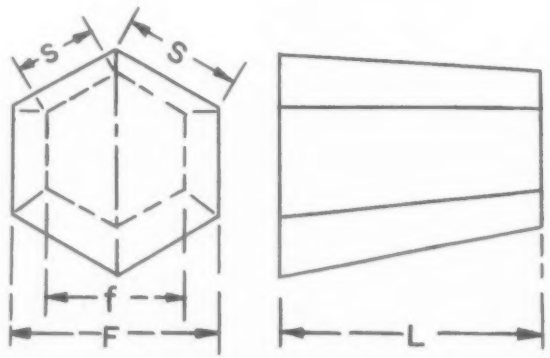
FORMULAS FOR DETERMINING THE WEIGHTS OF CASTINGS

(Continued from December)



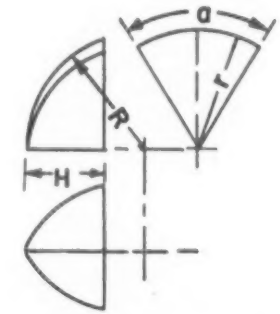
To find the weight of a pyramid with a hexagonal base, multiply the square of a side by the length, by the value of M, (Table IX) or multiply the square of the distance across flats by the length, by the value of C.

$$W = S^2 \, L \, M \text{ or } W = F^2 \, L \, C$$



To find the weight of a frustrum of a hexagonal pyramid, multiply the sum of the side of the large base squared, the side of small base squared and the product of the two sides, by the length, by M (Table IX) or multiply the sum of the distance across the flats of the large base squared, the distance across the flats of the small base squared and the product of the two sides by the length of C.

$$W = (S^2 + s^2 + S\,s)\, L\, M \text{ or}$$
$$W = (F^2 + f^2 + F\,f)\, L\, C$$



To find the weight of a sector of a spherical segment of one base, multiply the difference between the radius of the sphere and one-third of the height by the height squared, by the number of degrees in the angle by K, (Table X) or to the radius of the base squared multiplied by the height by the number of degrees in the angle by M, add the height cubed multiplied by the number of degrees by C.

$$W = (R - \frac{H}{3})H^2aK \text{ or } W = r^2HaM + H^3aC$$

Table X

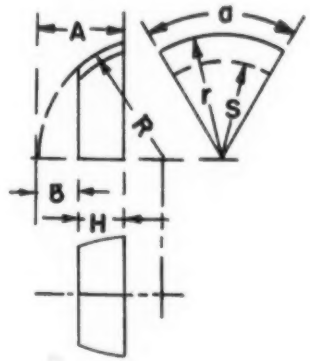
Wt. per cu. in.	K	M	C	Wt. per cu. in.	K	M	C	Wt. per cu. in.	K	M	C
.096	.00084	.000419	.000140	.250	.00218	.001092	.000363	.410	.00358	.001789	.000596
.100	.00087	.000436	.000145	.260	.00227	.001135	.000378	.420	.00367	.001833	.000611
.110	.00096	.000480	.000160	.270	.00236	.001179	.000393	.430	.00375	.001876	.000625
.120	.00105	.000524	.000174	280	.00244	.001223	.000407	.440	.00384	.001920	.000640
.130	.00113	.000567	.000189	.290	.00253	.001266	.000421	.450	.00393	.001964	.000654
.140	.00122	.000611	.000203	.300	.00262	.001309	.000436	.460	.00401	.002008	.000669
.150	.00131	.000655	.000218	.310	.00271	.001358	.000450	.470	.00410	.002052	.000684
.160	.00140	.000698	.000238	.320	.00279	.001397	.000465	.480	.00419	.002095	.000698
.170	.00148	.000742	.000247	330	.00288	.001440	.000480	.490	.00428	.002139	.000712
.180	.00157	.000786	.000261	.340	.00297	.001483	.000495	.500	.00436	.002182	.000727
.190	.00166	.000830	.000276	.350	.00305	.001527	.000509	.510	.00445	.002226	.000741
.200	.00175	.000873	.000291	.360	.00314	.001571	.000524	.520	.00454	.002270	.000756
.210	.00183	.000917	.000305	.370	.00323	.001615	.000538	.530	.00463	.002313	.000770
.220	.00192	.000961	.000319	.380	.00332	.001659	.000558	.540	.00471	.002356	.000785
.230	.00201	.001004	.000334	.390	.00340	.001702	.000567	.550	.00480	.002400	.000800
.240	.00209	.001048	.000349	.400	.00349	.001745	.000582	.560	.00489	.002443	.000815

Interpolation Table

Add'l. Wt.	Add'l. K	Add'l. M	Add'l. C	Add'l. Wt.	Add'l. K	Add'l. M	Add'l. C	Add'l. Wt.	Add'l. K	Add'l. M	Add'l. C
.001	.00001	.000004	.000001	.004	.00003	.000017	.000006	.007	.00006	.000031	.000010
.002	.00002	.000009	.000003	.005	.00004	.000022	.000007	.008	.00007	.000035	.000012
.003	.00003	.000013	.000004	.006	.00005	.000026	.000009	.009	.00008	.000039	.000013

For method of interpolation see Table II

FORMULAS FOR DETERMINING THE WEIGHTS OF CASTINGS



To find the weight of a sector of a spherical segment of two bases; from the difference between the squares of the distances from the bases to the pole multiplied by the radius of the sphere by the number of degrees in the angle by K, subtract the difference between the cubes of the distances from the bases to the pole multiplied by the number of degrees by C, obtained from Table XVIII, or to the sum of the squares of the radii of the bases multiplied by the height by the number of degrees in the angle by M, add the height cubed multiplied by the number of degrees in the angle by C.

$$W = (A^2 - B^2)RaK - (A^3 - B^3)aC \text{ or}$$
$$W = (r^2 + s^2)HaM + H^3aC$$

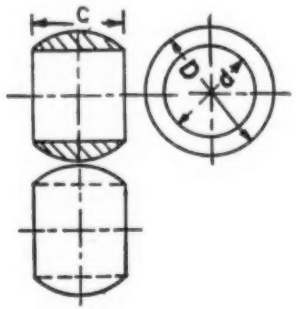
Table XI

Wt. per cu. in.	K	M	Wt. per cu. in.	K	M	Wt. per cu. in.	K	M	Wt. per cu. in.	K	M
.096	.0503	.1005	.210	.1100	.2199	.330	.1723	.3456	.450	.2356	.4713
.100	.0524	.1047	.220	.1152	.2304	.340	.1780	.3561	.460	.2408	.4817
.110	.0576	.1152	.230	.1204	.2408	.350	.1832	.3666	.470	.2460	.4922
.120	.0628	.1257	.240	.1257	.2513	.360	.1885	.3770	.480	.2513	.5026
.130	.0680	.1361	.250	.1309	.2618	.370	.1937	.3875	.490	.2565	.5131
.140	.0732	.1466	.260	.1361	.2722	.380	.1989	.3980	.500	.2617	.5236
.150	.0785	.1571	.270	.1414	.2827	.390	.2042	.4084	.510	.2670	.5341
.160	.0838	.1675	.280	.1466	.2932	.400	.2094	.4189	.520	.2722	.5446
.170	.0881	.1780	.290	.1518	.3037	.410	.2146	.4294	.530	.2774	.5550
.180	.0943	.1885	.300	.1571	.3142	.420	.2199	.4399	.540	.2827	.5654
.190	.0995	.1990	.310	.1623	.3247	.430	.2251	.4504	.550	.2879	.5759
.200	.1047	.2094	.320	.1675	.3352	.440	.2303	.4609	.560	.2931	.5864

Interpolation Table

Add'l. Wt.	Add'l. K	Add'l. M	Add'l. Wt.	Add'l. K	Add'l. M	Add'l. Wt.	Add'l. K	Add'l. M
.001	.0005	.0010	.004	.0021	.0042	.007	.0037	.0073
.002	.0010	.0021	.005	.0026	.0052	.008	.0042	.0084
.003	.0016	.0031	.006	.0031	.0063	.009	.0049	.0094

For method of interpolation, see Table II

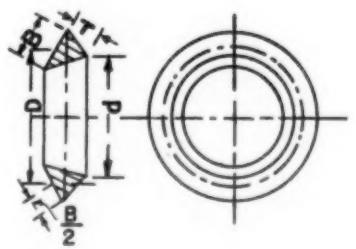


To find the weight of a ring made by cutting a cylindrical hole through the center of sphere, multiply the chord cubed by the value of K corresponding to the weight per cubic inch of material used. (See Table XI).

$$W = C^3K$$

The chord is equal to the square root of the result obtained by subtracting the square of the diameter of the hole from the square of the diameter of the sphere.

$$C = \sqrt{D^2 - d^2}$$

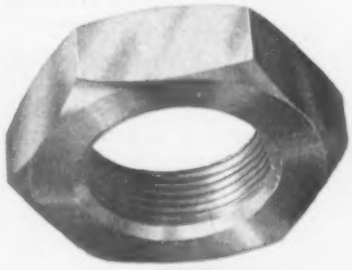


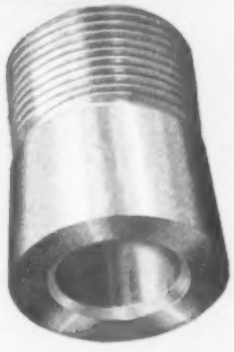
To find the weight of a ring of triangular cross section, multiply the base of the triangle by its altitude, by the sum of twice the diameter of the circle described by the center of the base and the diameter described by the vertex of the triangle by the value of K. (Table XI).

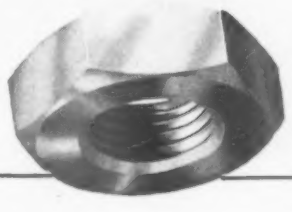
$$W = DT(2D + d)K$$

(To be Continued)

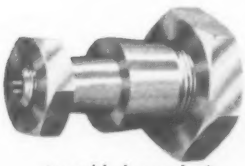
Get perfect Cope and Drag register — better castings — with UNIVERSAL FLASK PINS and BUSHINGS



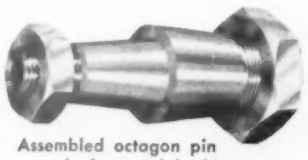




Only when cope and drag are perfectly lined up do you get the perfectly formed sand molds necessary to turn out true castings—and you can depend on perfect register of cope and drag once you accurately install Universal Standardized Flask Pins and Bushings. These modern accessories to good foundry practice are precision made, hardened, and ground for lasting accuracy. They anchor firmly with self-locking nuts to provide the positive stability vital to true register. Universal Standardized Flask Pins and Bushings are available for immediate delivery in several sizes of round, elongated, press fit and other standard types for use in cast iron, steel, and aluminum flasks. The pins and bushings illustrated are primarily for use in aluminum or magnesium flasks. Special types and sizes made to order. Write for complete information, and give us particulars of your requirements so we may make specific recommendations.



Assembled round pin and bushing.



Assembled octagon pin and elongated bushing.

Explosion view of octagon pin and elongated bushing.

UNIVERSAL ENGINEERING COMPANY • FRANKENMUTH, MICHIGAN

ELECTRIC FURNACE PRACTICE

Discussed by Steelmakers

By EDWIN BREMER
Metallurgical Editor
THE FOUNDRY

IN spite of the problems precipitated by the recent coal strike, and a hotel employees' strike settled just a week before its scheduled meeting nearly 550 attended the fourth annual Electric Furnace Steel Conference held at Hotel William Penn, Pittsburgh, Dec. 5, 6 and 7. The conference was sponsored by the Electric Furnace Steel Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers under the direction of Chairman Charles W. Briggs, Steel Founders' Society of America, Cleveland.

At the meeting William J. Reagan, Pennsylvania State College, State College, Pa., succeeded Mr. Briggs as chairman of the committee with Ernest Kirkendall as secretary. J. B. Caine, Sawbrook Steel Castings Co., Lockland, O., was advanced to chairman of the committee for the fifth conference to be held in Pittsburgh on Dec. 4, 5 and 6, 1947 at Hotel William Penn. Norman I. Stotz, Braeburn Alloy Steel Corp., Braeburn, Pa., was elected vice chairman of the committee. Annual reception and dinner was held Thursday evening, Dec. 5, with W. H. Colvin Jr., Crucible Steel Co. of America, as toastmaster. J. L. Rumble, General Motors of Canada Ltd., was principal speaker and discussed some of his experiences in construction of the Alcan highway and Canol pipeline.

Opening session was held Thursday morning with welcoming remarks by William J. Reagan and a response by Charles W. Briggs. After announcements and reports, T. L. Nelson, National Carbon Co., Niagara Falls, N. Y., presented a paper on "Carbon and Graphite Electric-furnace Electrodes." He pointed out that electric furnaces produce 6 per cent of the nation's steel ingots and castings, mostly of the high alloy type. He stated that there are 183 basic lined furnaces with a rated capacity of 4385 tons producing ingots; two acid lined ingot furnaces with 3 tons capacity; 116 basic lined furnaces with a rated capacity of 423 tons producing castings; 365 acid lined furnaces of 999 tons rated capacity making castings, and 118 furnaces with a rated capacity of 378 tons producing iron castings.

Mr. Nelson said that electric furnace electrodes are subject to three major troubles namely, abnormal oxidation, occasional cracking and breaking, and minor spalling. Oxidation is responsible for 60 to 75 per cent of total consumption. That can be minimized by attention to atmospheric seals at ports and charging doors. Cracking is due to stresses and is more critical at the joints. Spalling is due to local stresses set up by thermal gradients in the vicinity of the arc. Electrode sizes should be determined carefully for each furnace installation, and close attention should be given to joint assembly. Use of graphite nipples with carbon electrodes is advantageous as they give higher mechanical strength and conductivity with lower thermal expansion.

In an acid steel session with Harry Barnett, Welland Electric Steel Co., Welland, Ont., as chairman and Alden Safford, Chapman Valve Mfg. Co., Indian Orchard, Mass., as co-chairman, Floyd O. Lemmon, Ohio Steel Foundry Co., Lima, O., presented a paper on "Notes on Melting Heat and Corrosion-resistant Metals by the Acid Electric Process." According to the speaker, careful segregation of scrap is required to attain the desired final composition. Dividing the steels into four classifications or groups he gave a brief resume of melting procedure for each. In Group I where chromium is higher or similar to nickel the metal is melted down under the highest tap (125 v) for 30 minutes. Then the voltage is dropped to 60 and the metal refined for 30 minutes, during which time the temperature is raised to that suitable for pouring. Five or ten minutes after the power is turned on a slag addition is made consisting of 30 lb lime and 30 lb dry furnace sand previously mixed. Excessive power input must be guarded against to control silicon reduction from furnace lining and slag.

In Group II with high nickel (34-69 Ni and 11-19 Cr) melting is the same as Group I except during refining a boil during the last 15 minutes is instituted. Manganese addition is made before the boil ceases and the heat is tapped. For further deoxidation an addition of Ca-Mn-Si is made to the ladle. For Group III (18 Cr-8 Ni) a virgin charge with the lowest possible carbon content is selected. Standard melting practice is used except that slag material is added around the electrodes not later than 2 to 3 minutes after power is turned on. In Group IV (straight Cr) carbon content should be around 0.30 per cent to obtain a good boil. After melt down 50 to 60 lb iron ore is added. After reaction

(*Continued on page* 126)

NORMAN I. STOTZ

WILLIAM J. REAGAN

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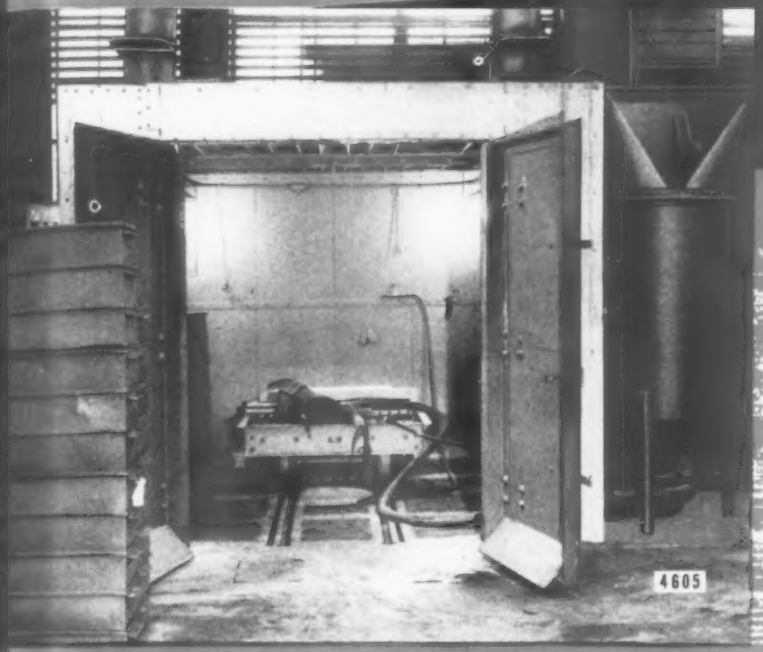
FOR YOUR CLEANING ROOM



SLY BLAST ROOM

This Blast Room receives the rough castings for blasting. The operator wears a Sly Helmet (shown on the car). Piping connects Room with the Sly Filter.

Sly features are: excellent illumination from plenty of dust-tight lighting fixtures; over-all, down-draft ventilation from *triple* construction ceiling; safety and ease in working aided by double floor of grating and perforated plates; used abrasive automatically cleaned and returned. All these help get more production.

Sly Blast Room (above) and Sly Dust Filter (below) at The Apex Electrical Mfg. Co., Cleveland, Ohio

SLY DUST COLLECTOR

This Dust Collector is connected with the Sly Blast Room by piping through which the dust-laden air is exhausted. Upon reaching the Filter, all dust is removed, by filtration through cloth, and drops into a hopper from which it is drawn off into a wheelbarrow underneath.

Installed five years ago, this Sly Dust Collector, like thousands of others, has given highly satisfactory service and has cost but little to operate and maintain. By efficiently exhausting the dust-laden air from the Blast Room, it has helped to do better blasting, in greater volume.

Have you a problem involving *dust* or *blast cleaning*? We'd like to hear from you.

THE W. W. SLY MANUFACTURING CO. 4753 TRAIN AVENUE CLEVELAND 2, OHIO

Foundry Statistics

(Reported by Bureau of the Census)

Copper-base Alloy Castings

(Thousands of pounds)

	Shipments — Total	Sand	Perm. Mold	Unfilled *Orders
1946				
Jan.	72,265	65,107	1,886	71,827
Feb.	60,856	56,992	1,713	72,736
Mar.	74,971	66,076	2,353	70,622
Apr.	77,919	71,105	2,390	71,108
May	76,054	70,748	2,453	76,792
June	70,910	66,378	1,755	78,449
July	66,695	62,369	2,339	78,018
Aug.	77,733	72,158	2,376	77,538
Sept.	76,835	71,545	2,415	84,183

* For sale only.

Gray Iron Castings

(Net tons)

	Shipments — Total	For sale	Unfilled *Orders
1945			
Jan.	861,524	536,499	1,921,572
Feb.	816,467	511,184	1,998,270
Mar.	927,925	587,380	2,089,046
Apr.	842,979	532,015	2,031,668
May	866,951	542,337	2,031,318
June	849,449	543,788	2,015,625
July	748,790	468,017	2,015,005
Aug.	750,050	462,364	1,817,801
Sept.	717,768	434,416	1,754,515
Oct.	767,209	461,720	1,741,981
Nov.	751,092	445,952	1,847,468
Dec.	678,091	397,529	1,877,095
1946			
Jan.	706,319	446,567	2,076,994
Feb.	541,177	368,384	2,152,766
Mar.	796,068	505,431	2,265,336
Apr.	856,678	529,323	2,378,348
May	757,041	454,194	2,491,811
June	735,060	435,866	2,633,118
July	810,829	475,059	2,668,782
Aug.	944,516	558,957	2,785,609
Sept.	913,824	534,310	2,881,906
Oct.	1,051,068	610,389	2,916,268

* For sale only.

Aluminum Castings

(Thousands of pounds)

	Shipments — Total	Sand	Perm. Mold	Unfilled *Orders
1945				
Jan.	45,588	27,168	10,692	.....
Feb.	44,091	26,674	9,844	.....
Mar.	50,275	29,473	12,355	.....
Apr.	46,320	27,090	11,185	.....
May	43,323	24,398	10,977	.....
June	39,074	21,050	10,254	.....
July	31,130	15,573	8,859	.....
Aug.	22,845	11,384	6,568	.....
Sept.	15,805	7,313	5,325	.....
Oct.	19,825	8,410	7,647	.....
Nov.	18,961	8,137	7,305	.....
Dec.	17,770	7,222	7,248	.....
1946				
Jan.	23,568	9,556	10,131	83,541
Feb.	23,231	11,613	7,866	94,858
Mar.	26,661	10,792	11,305	97,013
Apr.	27,692	11,562	11,010	100,267
May	29,179	11,827	12,220	117,710
June	28,496	11,674	11,767	118,747
July	28,828	10,706	12,213	124,457
Aug.	33,845	12,721	14,309	133,510
Sept.	32,003	12,445	13,045	136,237

* For sale only.

Malleable Iron Castings

(Net tons)

	Shipments — Total	For Sale	Unfilled *Orders
1945			
Jan.	78,788	54,111	345,112
Feb.	75,220	51,089	341,558
Mar.	85,307	58,711	349,935
Apr.	76,065	51,011	346,421
May	79,565	52,789	328,471
June	71,992	47,510	285,210
July	55,813	35,439	284,017
Aug.	52,647	33,239	282,136
Sept.	46,960	28,506	219,905
Oct.	59,096	37,307	229,618
Nov.	57,315	36,007	227,309
Dec.	51,963	35,168	236,648
1946			
Jan.	53,685	38,181	245,878
Feb.	40,156	29,338	247,644
Mar.	50,235	33,978	263,227
Apr.	65,010	36,298	275,055
May	62,598	34,975	279,065
June	61,650	35,468	275,845
July	64,446	38,021	271,981
Aug.	67,903	41,345	272,440
Sept	69,516	39,634	277,309
Oct.	79,368	46,501	281,047

* For sale only.

Magnesium Castings

(Thousands of pounds)

	Shipments — Total	Sand	Perm. Mold*	Unfilled Orders†
1945				
Jan.	10,424	6,149	4,028	....
Feb.	10,366	5,832	4,317	....
Mar.	12,646	6,703	5,677	....
Apr.	11,903	6,257	5,464	....
May	12,134	6,081	5,865	....
June	10,566	4,878	5,473	....
July	9,838	3,961	5,677	....
Aug.	4,960	1,820	3,036	....
Sept.	169	137	18	....
Oct.	251	216	13	....
Nov.	236	208	15	....
Dec.	261	230	14	....
1946				
Jan.	398	349	16	3,114
Feb.	438	366	35	3,338
Mar.	594	525	33	3,484
Apr.	570	465	36	3,297
May	661	587	45	3,778
June	717	623	46	4,063
July	628	477	53	3,986
Aug.	694	568	58	4,234
Sept.	811	676	61	4,096

* Includes incendiary bomb castings.
† For sale only.

Steel Castings

(Net tons)

	Shipments — Total	For Sale	Unfilled Orders
1945			
Jan.	210,213	165,116	983,137
Feb.	191,361	152,082	1,045,374
Mar.	222,591	173,506	1,047,660
Apr.	197,737	154,883	1,018,930
May	192,921	149,623	852,877
June	173,685	129,193	776,265
July	139,315	102,428	728,397
Aug.	131,411	98,080	585,559
Sept.	114,613	83,751	513,758
Oct.	130,344	99,495	460,339
Nov.	123,048	91,409	443,773
Dec.	115,239	85,391	434,287
1946			
Jan.	99,058	77,071	*358,926
Feb.	57,423	45,151	390,077
Mar.	101,396	80,843	412,325
Apr.	146,327	108,586	392,790
May	129,211	94,630	381,654
June	123,551	91,715	361,293
July	119,157	84,422	362,581
Aug.	130,450	94,653	374,731
Sept.	126,415	90,675	383,951
Oct.	138,206	98,945	389,002

* For sale only. Unfilled orders for 1945 include tonnage for sale and own use.

(*Continued from page* 124)

carbon is 0.05 to 0.06 per cent. Then preheated ferrochromium is added, allowed to dissolve and the temperature raised. Silicon and manganese are added and the heat tapped. Ladle additions of 3 lb Al and 3 lb Mn-Si per ton are made for further deoxidation.

R. J. Wilcox, Michigan Steel Castings Co., Detroit followed with a paper on "Induction Melting High Alloy Steels" in which he cited the following advantages for the process:

1.—Recovery of elements can be anticipated within close limits. Carbon control is accurate and easy to obtain. Accuracy of chemical control resolves primarily into correct segregation of alloy scrap and accuracy of weighing.

2.—Recovery of oxidizable alloys is high. For example, chromium recovery is 98.5 per cent compared with 87-90 per cent in the arc furnace.

3.—Larger quantities of alloy scrap can be used. Analysis control is not the limiting feature in scrap utilization although experience indicates that gas difficulties increase with increasing quantities of alloy scrap.

4.—Due to relatively small size of units they are extremely flexible in providing a supply of different analyses at frequent intervals. Heats of 400 to 1200 lb can be produced in a 1000-lb unit. Wash heats are not necessary in making straight Cr with low Ni following a Ni-Cr heat.

5.—Temperature control within close limits can be obtained during entire pouring operation of the heat.

Disadvantages are: 1—Melting labor cost is higher per ton than with larger arc units. 2—Analytical costs are high due to relatively small size and greater number of heats. 3.—Refractory costs are twice those for arc melting and power costs are 10 per cent higher. 4.—Pouring is less flexible than when a bull ladle can be used. Consequently melting unit must be close to molding units. 5.—Scrap preparation costs are higher since scrap must be small in size to obtain a compact charge for electrical contact. Large pieces melt slowly due to poor electrical contact.

Thursday afternoon, Dec. 5, a joint technical session on acid and basic practice was held under Chairman Charles W. Briggs and Co-chairman James Ma-

(*Continued on page* 128)

PROMPT DELIVERY

On "Industrial" Custom-Built

STEEL FLASKS

A FLASK YOU CAN TRUST —STAYS ACCURATE

Parting Line on cope and drag is surface-ground for accurate fit.

STANDS SHAKEOUTS —TAKES A SQUEEZE LONGER

All-Welded construction from hot-rolled steel plate.

"Industrial" has been supplying "made-to-order" flasks and slip jackets to the automotive foundries in Michigan for some time, and now since "Industrial" has been able to offer the *general* foundry trade their complete facilities and specialized "know-how", more and more foundries are specifying and using "Industrial."

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(*Continued from page* 126)

leney, Bethlehem Steel Co., Bethlehem, Pa., Clarence E. Sims, Battelle Memorial Institute, Columbus, O., presented a paper on "Mechanism of the Carbon-Oxygen Reaction in Steelmaking" which pointed out that the solubility of CO in steel, while not proved or disproved by direct evidence, is indicated by indirect evidence. The reaction between C and O can be instantaneous, building up a pressure of CO which gets out of the steel at the hearth or by diffusion into a rising bubble. Variable solubility of CO with pressure supplies a reservoir for CO, and gives the reaction flexibility. When CO is liberated the equilibrium is upset and the reaction $C + O \rightleftarrows CO$ must move from left to right to supply the deficiency there.

Difficulty in getting some heats to boil with strong oxidizing conditions present, and then having them begin to boil with violence, is attributed to conditions unfavorable to bubble formation, and building up a supersaturation of CO. On the other hand, a boil which tapers off to a quiescent state, and then is caused to start violent ebullition of gas by thrusting a steel bar into the bath is ascribed to the fact that the solid steel supplies a surface conductive for the evolution of dissolved CO. In a similar manner CO is liberated at the frozen shell of a rimming ingot. Carbon-oxygen reaction establishes the relative quantities of carbon and oxygen present in a steel bath up to the time of deoxidation according to the expression: C per cent × O per cent equals 0.0189 ($\sqrt{}$C per cent − 0.09).

Gerhard Derge, Carnegie Institute of Technology, Pittsburgh, presented a paper written in co-operation with S. F. Urban, Titanium Alloy Mfg. Co., Niagara Falls, N. Y., on "Oxygen in Basic Electric Furnace Baths" in which the following conclusions were given: 1-A variation in the CaC_2 content of the slag had little effect on FeO content of the bath. 2—The FeO in bath and slag reached a minimum at approximately the same time, but the minimum of FeO in the bath was dependent upon the C in the bath rather than on the FeO in the slag. 3—The FeO in the bath reaches a minimum 40 to 80 minutes after slag-off. 4—A variation in the lime-silica ratio between 2 to 4 in the reducing slag had no influence on sulphur removal. 5—Addition of coke to the slag did not increase S in the bath. 6—Oxygen in the bath never drops appreciably below the value determined by the carbon-oxygen equilibrium, no matter how long it is left under a reducing slag.

In the absence of Axel Hultgren, Tekniske Hogskolan, Stockholm, Sweden, and author of a paper on "Origin of Silicate Inclusions in Basic Electric Arc Furnace Steel of Higher Carbon Contents," an abstract was presented by G. R. Fitterer, University of Pittsburgh. Pouring with a restricted stream leads to an enormous increase in inclusions in 2-in. test ingots, according to the author, while the normal size 9 and 14 in. sq ingots were comparatively free from inclusions; this was assumed to be due to the silicate drops having opportunity to rise and escape in the slower freezing steel. Growth of silicate inclusions before freezing of the steel in the mold is attributed to precipitation from solution and diffusion in the liquid steel, and not from coalescence of small droplets.

Friday morning's acid steel session was presided over by chairman C. C. Spencer, Electric Steel Castings Co., Indianapolis, and Co-chairman Robert H. Jacoby, East St. Louis, Ill. In a paper on "Acid Electric Slags," G. R. Fitterer concluded that slag fluidity as determined with the Herty-Christopher mold can be used to indicate slag analysis, particularly when the charge is uniform with respect to manganese; metal temperature and temperature changes; rate of carbon drop, and finishing or "go-ahead" conditions. Heats tapered off to the same slag fluidity will taper off in carbon content as well as temperature. Heats changing rapidly in fluidity at the "go-ahead" point also are changing rapidly with respect to carbon content and temperature.

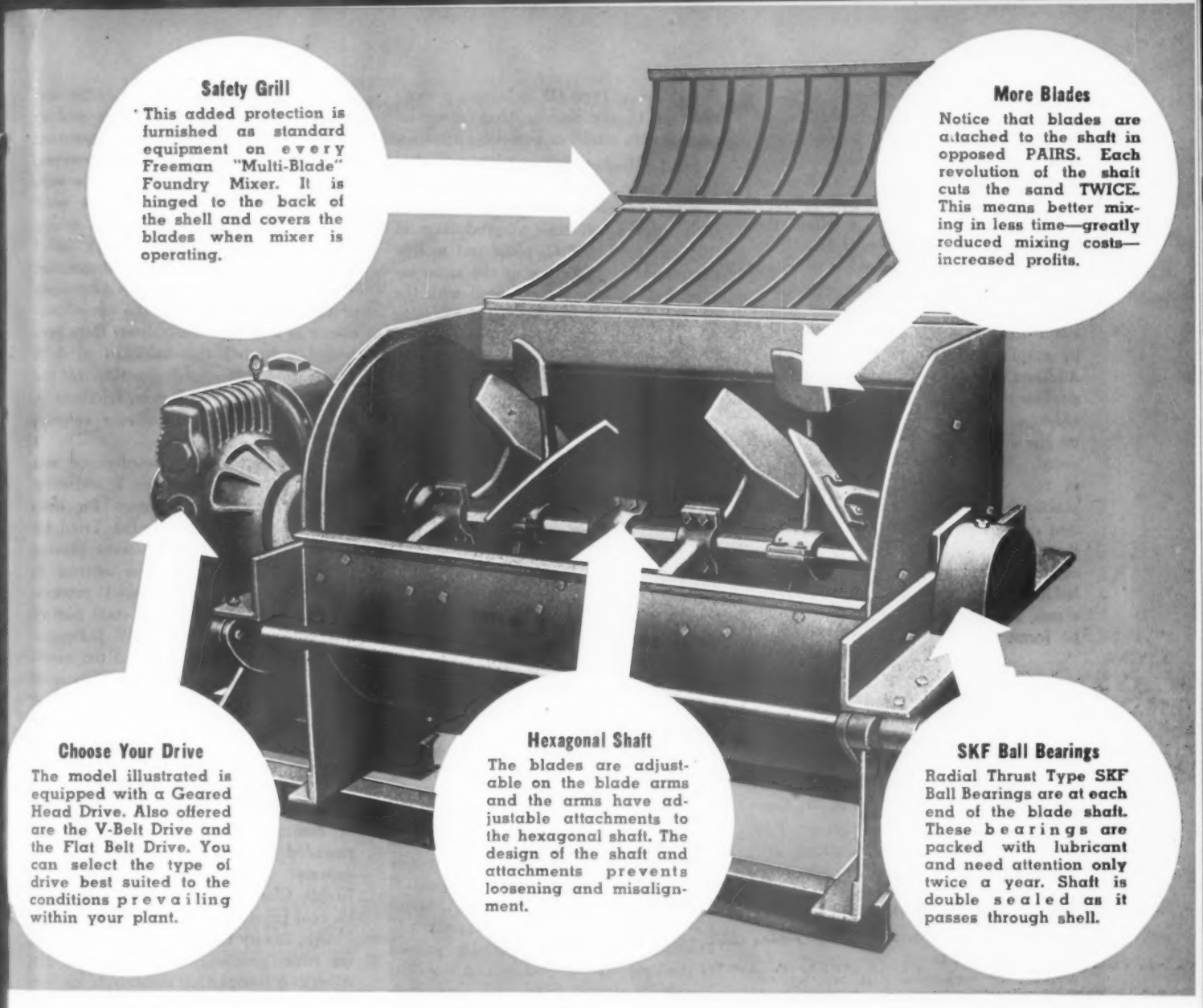
Suggests Oxygen Tuyeres

In discussing "Slags Are a Necessary Evil," E. C. Troy, Dodge Steel Co., Philadelphia, stated that since presence of controlled quantities of reactive oxygen is at present essential to the process of steelmaking, slags are necessarily a part of the desirable product of present-day electric arc furnace practice and will remain so until some other means of controlling oxygen additions is found. Disadvantages of slag include attack on furnace refractories; makes observation of bath temperature difficult; requires continual adjustment; mass of slag requires time, alertness and manipulation to maintain proper condition; requires 8 per cent of power and 5 per cent of expensive components of charge and refractories to produce a waste by-product which must be laboriously handled and discarded. Mr. Troy suggested that future procedure might involve the use of oxygen tuyeres at the back of the furnace through which oxygen controlled as to pressure and quantity could be admitted to perform the necessary functions without the presence of a slag covering.

Final paper at the session was presented by J. B. Caine, Sawbrook Steel Casting Co., Lockland, O., and was entitled "You're Stuck With Slag—Why Not Use It." With curves and other data based on experimental work he in-

(*Concluded on page* 130)

FOREIGN VISITORS: Recent visitors to this country were H. H. Berresford *(left)* and Dr. J. E. Hurst *(right)*, managing director and director of research, respectively, of Staveley Coal & Iron Co. Ltd., Chesterfield, England. They are shown with T. H. Benners Jr., Woodward Iron Co., chairman of the Birmingham District Chapter, AFA, at the Nov. 8 chapter meeting in Birmingham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SKF Ball Bearings
Radial Thrust Type SKF Ball Bearings are at each end of the blade shaft. These bearings are packed with lubricant and need attention only twice a year. Shaft is double sealed as it passes through shell.

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(*Concluded from page 128*)

dicated that the partition constant for oxygen or iron oxide between metal and acid slag against temperature seems to be independent of the analysis of either slag or metal. If that is correct then, according to Mr. Caine, it offers the possibility of producing steel free from pinhole porosity when poured in green sand without the use of strong deoxidizers, using the partition constant to lower the oxygen content of the metal by employment of low iron oxide slag. Addition of various deoxidizers to molten steel to remove oxygen tends to form inclusions in the metal. Lowering the oxygen content without additions to the metal appears to be the only way out of that difficulty, and can be accomplished by lowering the iron oxide content of the slag—the oxygen content of the metal following. Any decrease in the oxygen content of the metal by the slag, below the reaction level of the deoxidizers, means that fewer inclusions will be formed.

Sulphur Lowers Ductility

Friday afternoon's session was devoted to a discussion on sulphur, with James A. Bowers, American Cast Iron Pipe Co., Birmingham, Ala., and Charles Locke, West Michigan Steel Foundry, Muskegon, Mich., presiding. E. W. Ganslein, American Steel Foundries, East Chicago, Ind., presented a paper prepared by G. A. Lillieqvist of the same company on "Effect of Sulphur on Cast Steel" which stated that sulphur is an active inclusion former and the higher the sulphur content, the greater the number of inclusions that are formed. With no aluminum addition, the sulphur does not materially affect the ductility of the steel. When a critical amount of aluminum is added, the harmful stringer-type inclusions are formed. With low sulphur content below 0.025 per cent, the ductility properties are not seriously affected by these inclusions, but in the higher sulphur ranges a tremendous drop in ductility occurs.

Increasing sulphur contents lower the room-temperature Charpy impact values regardless of the type of inclusions, although the stringer-type inclusions cause the greatest drop. Increasing sulphur contents appear to increase resistance to grain growth both with and without aluminum additions. Sulphur does not appear to affect the fluidity of steel materially in the ranges studied. Sulphur decreases the strength and ductility of steel in the region of 2440 F; thus it would be expected that increasing sulphur contents makes steel more susceptible to hot tears. Improper inclusions make steel more susceptible to hot tears and sulphur plays a part in producing that condition. A casting with crystalline or Type III inclusions is more resistant to hot tearing than a similar casting with round or eutectic inclusions.

M. J. Healey, General Electric Co., Schenectady, N. Y., discussed methods of sulphur control in basic-lined furnaces with specific reference to production of 0.25 per cent max C, plain and molybdenum steels. Procedure is the same except that a longer boil is used with the molybdenum steel. Basicity of the slag is maintained at the ratio of 3:1 and constant adjustments must be made since silica is being added from the charge materials and from the furnace roof, etc. Elimination of sulphur depends upon CaO, and that should be maintained as high as possible without running into trouble with viscous slag. A good boil must be maintained since that condition increases the reaction between metal and slag.

Remainder of the session included a brief resume of less well known methods of sulphur removal in the acid electric furnace. Jerome Strauss, Vanadium Corp. of America, New York, described the Perrin process developed in France and used on the Continent. Procedure consists of a violent intermixing of molten steel with a molten slag of known composition which may be a siliceous or calcium aluminate slag. About 5 per cent will remove two-thirds of the sulphur present in the steel. Charles Locke abstracted a paper prepared by H. C. BeMent, Campbell Wyant & Cannon Foundry Co., Muskegon, Mich., on use of fused soda ash. Method is used in the triplex process of steel production. Molten iron from the cupola is freed from slag and then treated with the soda ash. This reduces the sulphur from 0.12 per cent to about 0.05 per cent, the metal then being transferred to the converter for blowing. Temperature of the iron from the cupola is about 2700 F.

Increase Steel Fluidity

George Motock, Metalloy Corp., Minneapolis, described the use of spodumene, a natural lithium-aluminum-silicate rock containing about 8 per cent Li. According to the speaker, additions of the material cause a marked increase in slag and metal fluidity. Lithium is believed to form volatile sulphides which pass off as a gas. Addition is 20 lb to a 6000 lb heat and shows a reduction of 55 per cent of S in steel. Material may be added in furnace about one-half hour before tapping or in the ladle.

C. N. Arnold, Blaw-Knox Co., Pittsburgh, spoke on the application of metallic sodium for sulphur removal. He stated that an average of 0.028 per cent S could be reduced to 0.020 per cent, and that tests indicated that steel treated with sodium showed double the Charpy impact value at room temperature and at minus 50 F as compared with untreated steel of the same composition. However, one difficulty is that one cannot be sure the sodium treatment is effective until the steel has solidified and tests made.

H. V. Beasley, International Nickel Co., Pittsburgh, presented an abstract of a paper prepared by T. N. Armstrong of the same company on the use of selenium as a sulphur neutralizer. Data presented indicated that addition of 0.10 per cent Se increased ductility of the steel considerably. However, selenium in conjunction with aluminum or calcium requires less selenium.

Final meeting of the conference was held Saturday morning, Dec. 7, and comprised an educational session for both acid and basic steel producers. Tried for the first time, almost 300 were present which indicates the intense interest in a meeting of this type—and presumably it will become an important part of the conference proceedings. W. J. Reagan and J. B. Caine presided and the meeting was opened by the presentation of a lecture on basic practice by Gilbert Soler, Atlas Steels Ltd., Welland, Ont. That was followed with a lecture on acid practice by Clarence A. Sims, Battelle Memorial Institute, Columbus, O. The meeting broke up into a discussion of melting problems. Questions propounded were answered by a panel of experts which included Charles W. Briggs, Clarence A. Sims and J. B. Caine on acid practice; Gilbert Soler and H. E. Phelps, Rotary Electric Steel Co., Detroit, on basic practice; Samuel Arnold III, American Bridge Co., Pittsburgh, on furnaces; R. E. Birch, Harbison-Walker Refractories Co., Pittsburgh, on refractories, and Harry W. McQuaid, Cleveland, as member at large.

AFA Subcommittee Is Named

Harry W. Dietert, Harry W. Dietert Co., Detroit, is chairman of the 1946-47 subcommittee on core strengths, core tests committee, sand division, American Foundrymen's Association. O. Jay Myers, foundry research director, and R. D. Walter, research chemist, Werner G. Smith Co., Cleveland, are vice chairman and secretary, respectively.

Other members are A. E. DeClercq, metallurgist, Lauhoff Grain Co., Danville, Ill.; G. R. Gardner, aluminum research laboratories, Aluminum Company of America, Cleveland; J. A. Mescher, coreroom foreman, Unitcast Corp., Toledo, O. and R. E. Morey, metallurgist, U. S. Naval Research Laboratory, Washington.

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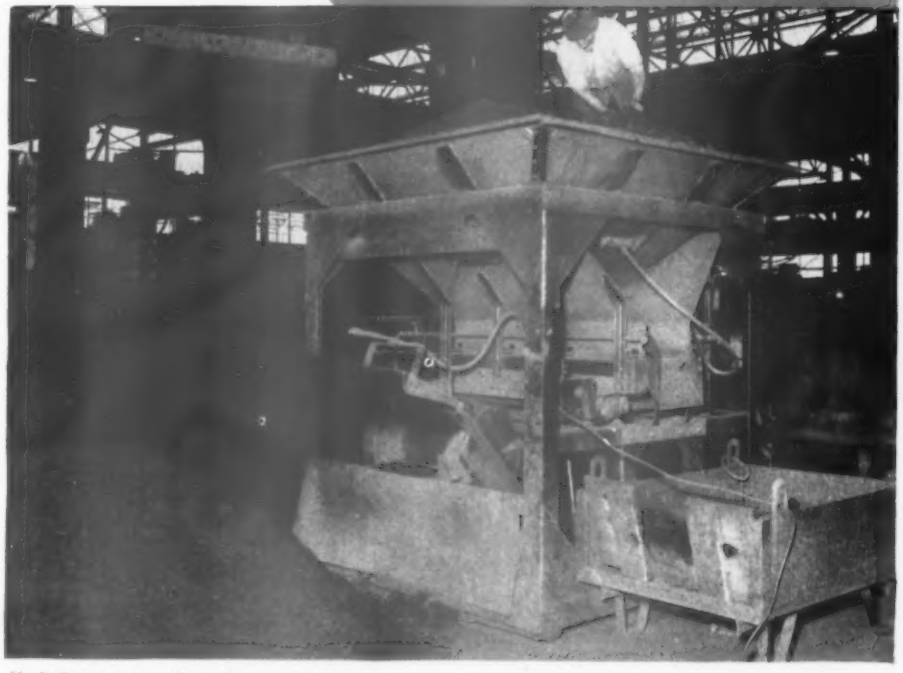
Portable—set it anywhere in your foundry and convey the sand to it . . . or move it about to bays with overhead crane. For the best in foundry equipment specify Royer—send for Bulletin 744.



York Corporation, York, Pa. uses Royer Combination to prepare backing sand for snap moulding unit. Sand discharges through spray for adding moisture during aeration.

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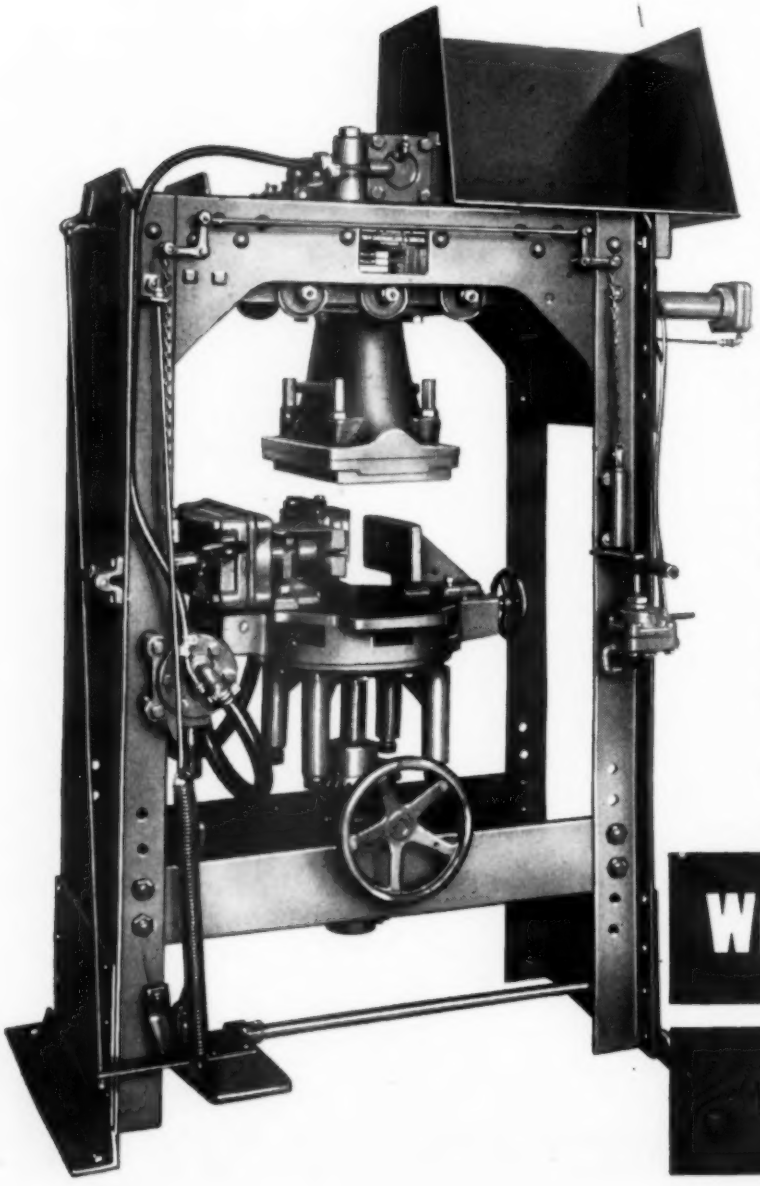
General Purpose Core Blowing Machine



The DEMMLER No. 1 general purpose Core Blower is a popular machine because it is a profitable machine to own.

Its versatility in blowing both small and medium size quality cores at a high rate of speed with maximum economy, coupled with its modest price and rugged dependability, has made it the leader in its field.

The machine is built on a rugged structural steel frame, has a productive capacity of about 200 core boxes per hour and is available with several different sizes of sand magazines. Job changes in from five to ten minutes are easy because hand wheels quickly raise and lower the chuck table and make the proper chuck jaw adjustments. The clamping, blowing and releasing operations are performed in less than four seconds.

For general-purpose small and medium core blowing work, choose the DEMMLER No. 1—the core blower with an unchallenged reputation for dependable, profitable performance.

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ACCIDENT PREVENTION

Campaign Outlined For Foundries

By K. A. COLAHAN
Atlantic Division Engineering Manager
American Mutual Liability Insurance Co.

AS FAR back as 1928, the committee on safety and production on the American Engineering Council completed the first authoritative research of industrial accidents and production. The summation of the data collected from all types of industrial plants in all parts of the country showed conclusively that several generalities could be accepted as established facts:

1. That there is a correlation beween safety and efficiency of production, and in general, the safe plant is the efficient plant.
2. Efforts to improve safety performance do not interfere with production.
3. Maximum productivity is ordinarily secured only when the accident performance tends toward the irreducible minimum.
4. The incidental or accompanying cost of industrial accidents is a loss in industrial operation and should not be neglected.
5. *Effective* organized safety work is being carried on only in a relatively small percentage of industrial plants.

Original Conclusions Are Sound

Industry has made great progress since 1928 in perfecting the technique of loss prevention, but these facts are still as true today as when they were published and are as true for the foundry trade as for any other industrial group. During the past 17 years we have seen many concrete cases demonstrating that these original conclusions are sound and have been proven by tests.

The American Engineering Council was correct in its assumption of a correlation between productivity and accident prevention. There seems to be no question about this. When accidents go down, production rates go up. Further, and more important, success in both fields can be achieved in exactly the same way and by exactly the same means. There is no mystery about reducing accident frequency. You men all operate successful businesses—you know how to secure the quality of product you desire and in profitable quantities. Obviously you know the answer to reducing losses—just put "safety" on the production line and treat it as you would any serious operating problem and with the same forceful technique which has secured your production successes.

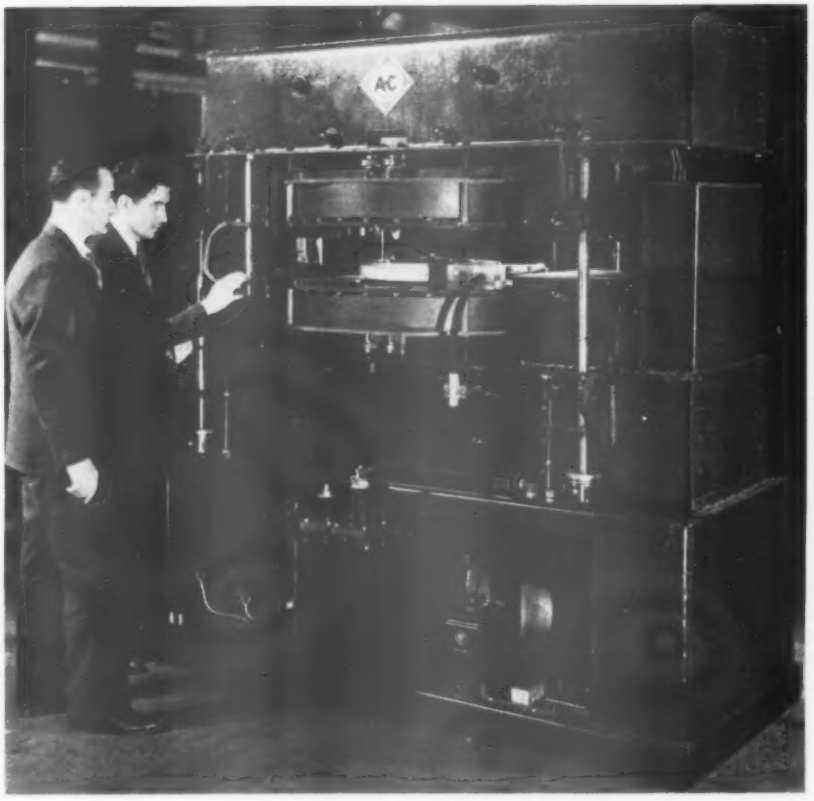
Loss prevention is not an extraneous function that can be effectively superimposed on but kept separate from normal routine. Neither can it, successfully, be left entirely to a separate safety department or safety director, no matter how good they may be. It is your personal problem just as production rates, quality of product, maintenance costs and all the allied items of running a successful business are your problems, and needs your personal attention and your personal direction. This is the first requisite for a successful accident loss prevention campaign. Loss prevention is an executive function — delegated of course — but still an executive interest and subject to executive follow-through and executive action.

The acceptance of employment implies a willingness to perform certain duties in accordance with the employer's wishes. As a whole, labor is loyal and willing to cooperate, but there is no group in the world who can detect insincerity more quickly than they. You can bet that every person in your employ knows to a hair line just what you insist upon getting. Half-hearted or sporadic safety measures are scarcely worth the time and never will produce effective loss prevention results.

If you wish to reap the rich rewards of a successful accident loss prevention campaign, you should:

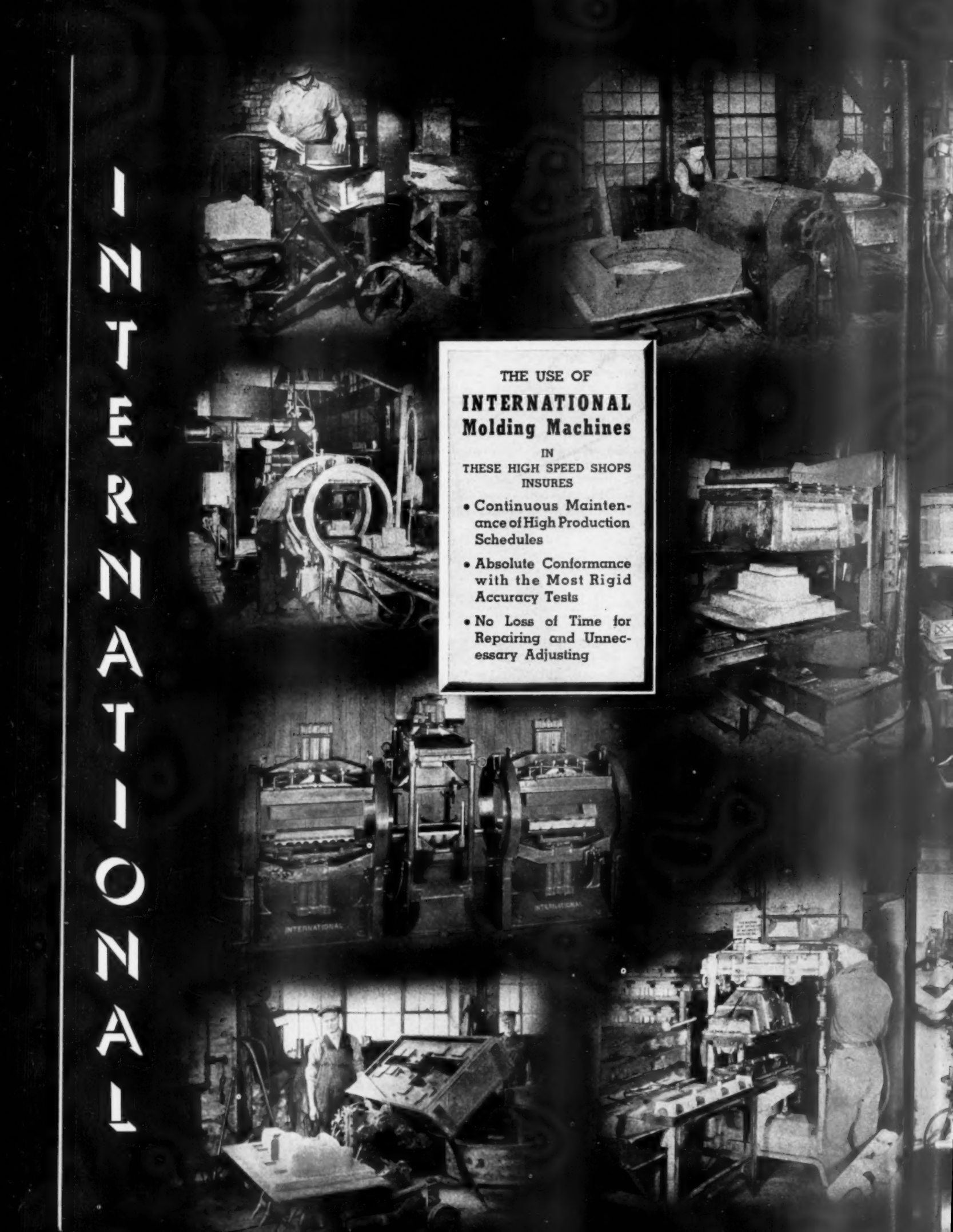
1. Personally explain to all managers, superintendents, supervisors and foremen, the advantages of the program, your plans, your determination to control accident loss factors, and that they must accept their share of the responsibility for carrying out your wishes.
2. Delegate the direction of loss prevention activities to one competent man who will work in staff relationship with the line of the production organization. The line shall be held accountable for failure to put into action the safety advices of this loss prevention coordinator.
3. Appoint committees to assist him and specify systematic meetings to be regularly attended and exclusively devoted to accident loss prevention.

(*Continued on page* 136)



BETATRON: Closeup of 20-million-volt betatron built by Allis-Chalmers Mfg. Co. and installed recently at the U. S. Army Arsenal, Picatinny, N. J. Invented by Dr. D. W. Kerst, University of Illinois, its x-rays are powerful enough to take a picture through a foot of steel in a few seconds. The Army will use it to disclose defects in large loaded shells

From a talk given by Mr. Colahan before the Chesapeake Chapter of the American Foundrymen's Association, Baltimore. Reprinted from *American Mutual Magazine*, July, 1946.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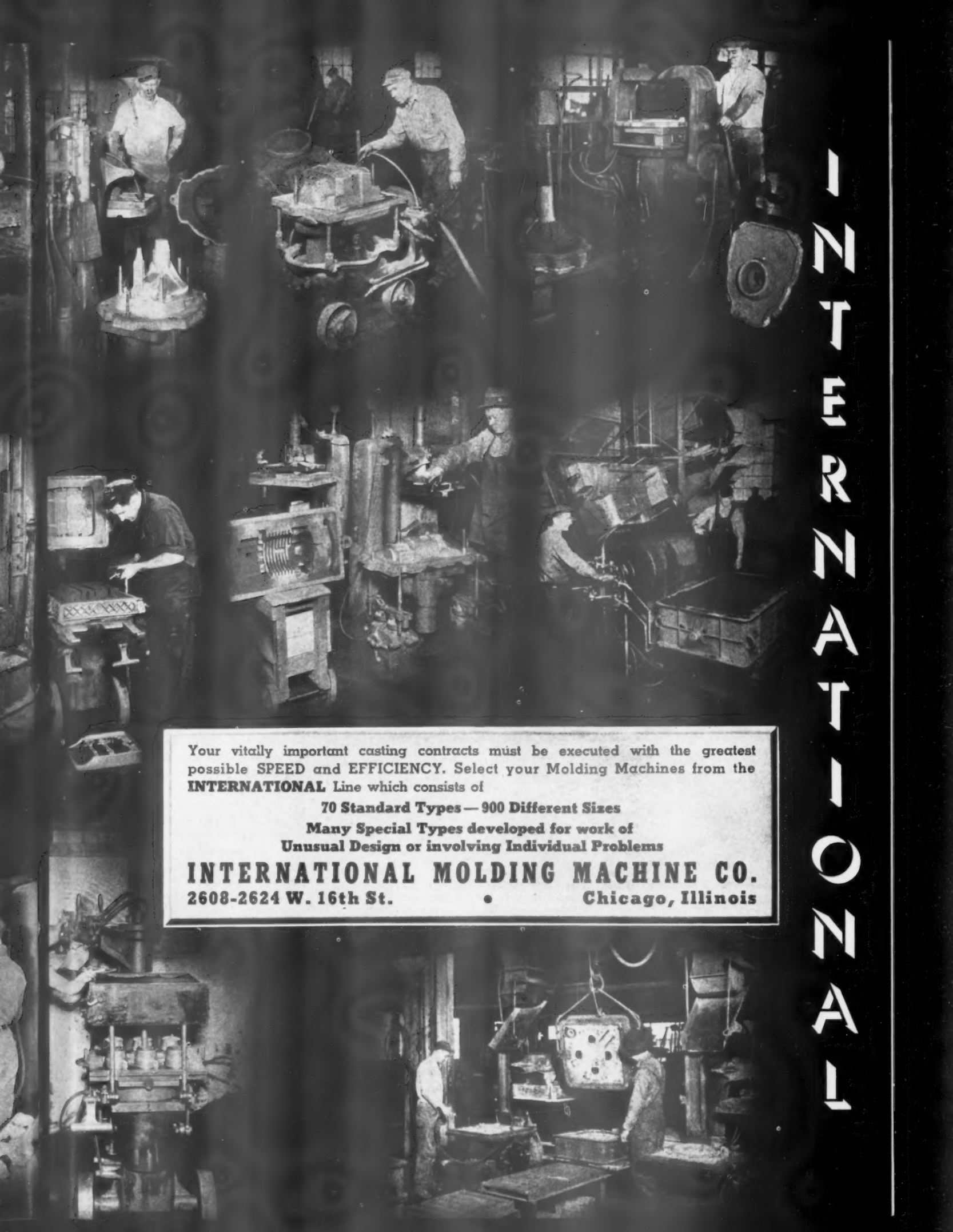

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(*Continued from page* 133)

4. Institute records and reports—as few and as simple as possible, but adequate to keep you and your safety organization fully informed.

5. Conscientiously attend meetings of the safety organization yourself and review reports until you are satisfied with the rate of progress.

6. Make it a point to discuss loss prevention in all contacts with your supervisory staff either collectively or individually.

7. Solicit cooperation of all employees after they have been fully informed of top management's favorable interest in accident prevention.

8. As an example of your intentions, control all physical exposures promptly and supply needed personal protective equipment and see that it is used.

9. Secure competent assistance to train staff in efficient accident prevention procedure.

That is a very brief outline of a successful accident loss prevention program. It all adds up to one fact—*you, gentlemen, are it.* Loss prevention will never show satisfactory results without your enthusiastic interest, executive leadership and vigorous follow-through. That is *your* job.

I emphasized placing accident loss prevention activities in the direct production line-of-authority. Production and accident loss prevention are so inextricably entwined that they should never be handled as separate entities. In new construction or new processes, reconversion, maintenance and other normal functions, both production efficiency, and loss prevention efficiency, must be considered together. Rules, regulations or work orders affecting either or both should come from the same source and carry the same authority. Production orders come to the workers in the various departments by way of the general manager, plant manager, superintendent and foremen. Accident prevention orders must follow the same route to secure equivalent results. By all means couple accident loss prevention to production at the proper level to assure complete cooperation and equal consideration.

This leads to the established conclusion that the foreman is the key man in industry — the key man in production and likewise the key man in accident loss prevention. The foreman represents *you* to the man who actually does the work. He interprets the policies of your company and gives the actual orders necessary for the proper sequence and quality of the work. He is responsible for all phases of production. He is constantly in his department and knows all details of the work and has the opportunity to see all that goes on. Therefore, he also should be held responsible for effective loss prevention and should be trained to assume duties connected therewith.

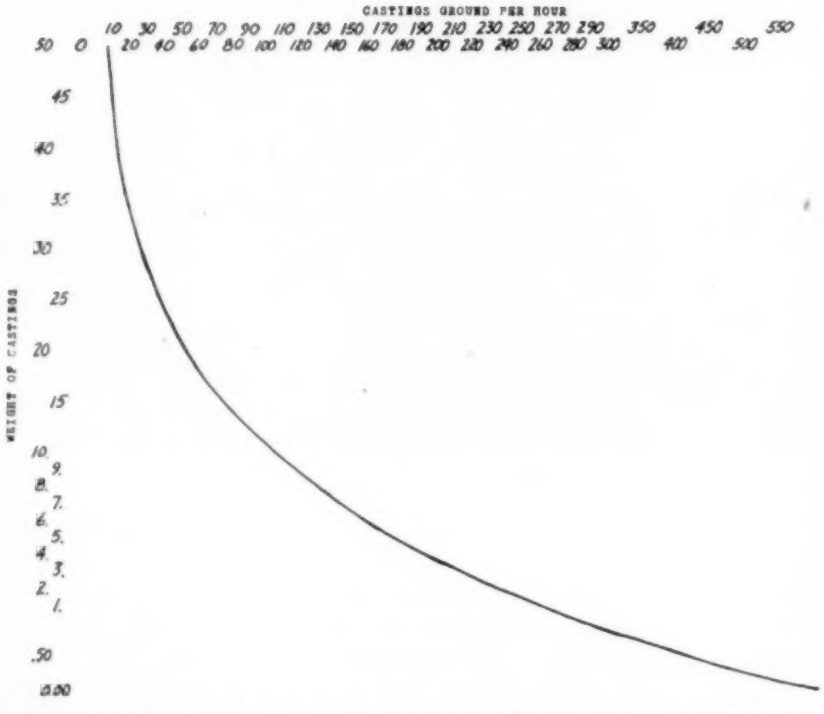
Foreman Carries Out Policy

Fortunately the foreman already has all of the tools needed for this new obligation. Obviously he has been able to secure for you an adequate volume of work of an acceptable nature or you would not have retained him in the capacity of foreman. In the process of accomplishing this he has learned the characteristics of the men in his group. Consciously or unconsciously he has learned the psychology of securing what he wants from each man. He has learned to get the best results from Joe by commending his work and appealing to his pride; that Bill needs encouragement; that Jack can be shamed into better work; and that some other chap needs more drastic persuasion. Your foreman knows how to handle his men; he will get them not only to produce what you want but also to produce it in the way you want it done if you are emphatic in expressing your desires, show him what you want done, and insist that it be done.

To be successful it is probable that the majority of foremen will have to be trained in this work. They do not need training in how to accomplish the job—in the psychology of getting results—but rather training in what results are expected. In many cases they have lived with conditions so long that the latter have become habit. They cannot see the woods because of the trees.

(*Continued on page* 138)

Chart Indicates Grinding Time



The above table is based on cast iron. To estimate castings ground per hour for other type castings use the following percentages: Carbon steels 70 per cent; malleable iron after anneal 90 per cent; malleable iron before anneal 105 per cent; brass 110 per cent; aluminum 120 per cent; magnesium 125 per cent.

THE accompanying chart and description by David G. Anderson, foundry engineer, National Founders Association, 120 South La Salle St., Chicago, are taken from the monthly *Bulletin* of the association.

The grinding removal of gate projections on certain types of small castings is sometimes more time-consuming than the molding operation. In the approach to an optimum balance of casting procedures, the extent of grinding is fully considered when designing pattern equipment. A gate conveniently located—having a minimum width and thickness and without jeopardizing metallurgical requirements—is a satisfactory pattern design approach. Further grinding considerations in pattern designs are the parting planes and core print junctions, all of which influence the extent of grinding. An indication of approximate production of average castings ground per hour is indicated on the accompanying graph.

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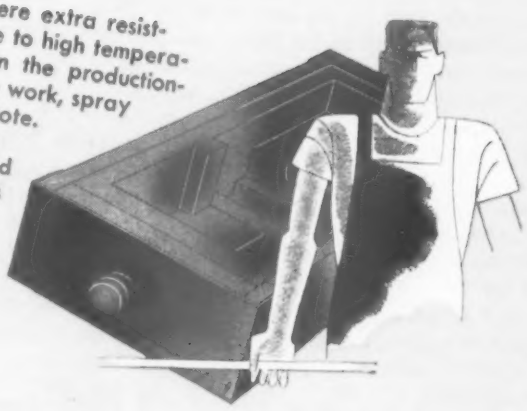
mexacote Where extra resistance to high temperature metal is demanded in the production-casting of light and medium work, spray molds and cores with Mexacote. Quickly mixed with water to paste consistency, then thinned for spraying. Mexacote forms a firm coating that will not crack, shrink, scab, peel, or buckle under heat, can be dried by torch or lamp.



No. 172 blacking

A high quality wet blacking for cores and dry sand molds, No. 172 Mexican Blacking is easily and smoothly applied with swab, brush, or spray. Turns the hottest iron and allows sand to peel cleanly, making it ideal for medium, extra large, and pressure castings weighing 1 to 25 tons. Ready mixed with bond, requires only water.

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MAN-TO-MAN
on the Molder's Bench

"A Place in the Sun"

By RALPH L. LEE

IN going through a plant with its manager not so long ago, I noticed in one department the folks working there had their names painted on their benches. "Why not?" I said to myself, "why shouldn't a person have his name on his place of work, just like a doctor has his on a shingle or a farmer on his mail box?"

When I asked the manager how he ever happened to think of such a good idea, he said he hadn't had a thing to do with it, nor any of the other bosses as far as he knew. He guessed, and none too enthusiastically, that one of the boys must have painted his name on his bench as sort of a lark and the idea took hold and spread.

We had so many other things to talk about we didn't get back to the subject, but after I left I couldn't get the incident out of my mind. The more I thought about it, the more I began to suspect that there could be a whole lot more to it than appeared on the surface.

In spite of all that is being written and said today about how shop people watch clocks and work only for money, I thought I saw in the name on the bench incident the outward sign of a deep inner craving people have for a job they have been able to master and for the place in which they do it. While I didn't talk to the individual who started this fad, I imagine he must have felt that he had built a definite place for himself in his work neighborhood, sort of a home into which he had the best right to enter, one in which he knew better than anyone else where everything was, what was to be done in there and how it best could be done.

While I don't imagine this fellow even tried to reason the matter through as I have done, I am sure that he, like most other people have, down inside, an irresistible urge to build a place for themselves, one that fits them, reflects them, and in which they are known by their fellows. Then having built this place I am sure they must also have an urge just as strong to sign their name to it, just as I like to sign my name to an article I have written, or an artist to his painting, a composer to his song.

As a result of my years of shop work and my visits through places of work, I know for a fact that hundreds of good men have turned down jobs at much higher pay rather than leave the ones where they felt at home. Take my old Uncle Albert, for instance. He was a packer or a crater in a farm implement plant. He'd been there for years and was left pretty much on his own. He knew where everything was and how to crate just about anything they brought to him, even the most cockeyed and seemingly uncrateable stuff.

One day they came to him with an offer to promote him to the job of shipping department head. I remember that we, his relatives, thought he had a screw loose for turning down such a fine opportunity. But in spite of our criticism he wouldn't change his mind. He said he was getting along all right, he liked the job, the people he was working with, it was home to him, he didn't want to leave it and why in hell didn't we, his relatives, mind our own business.

I may be making a mountain out of the bench sign molehill, but I am convinced that no human being will ever be free of the urge to build a place for himself, and that his inability to do it in some of our modern foundries and factories may lie at the core of some of our most difficult labor relations problems of today.

Now that I think of it, most of the companies I have seen get started and weather the storms through to success did so largely through the efforts of folks who stuck to their uncertain jobs, in spite of poor and uncertain pay and better offers on the outside, all for the sake of building a tailor-made place for themselves which would be recognized as theirs by everyone around them.

It wouldn't surprise me one bit that way down underneath the success of 20 and 30-year-old companies, beneath 10, 15 and 20 year employment records of successful sweepers, watchmen, cleaners, coremakers, cupola tenders, molders, patternmakers, clerks and what have you, will be found opportunities each had and grasped for making an exclusive place for himself.

I am sure that it isn't human nature to want to be kept, to accept handouts or to work on jobs and in places built for just anybody. It might not be a bad idea for us in our efforts to engineer heat, dust, dirt and sweat out of our foundry jobs to be very careful lest, at the same time, we do not also engineer out of these jobs every possible opportunity for our people to build places, careers and personal successes for themselves.

(*Continued from page* 136)

The foreman will have to be taught what unsafe conditions and working habits are, and how to detect them; something of job analysis; correct accident investigation and allied subjects.

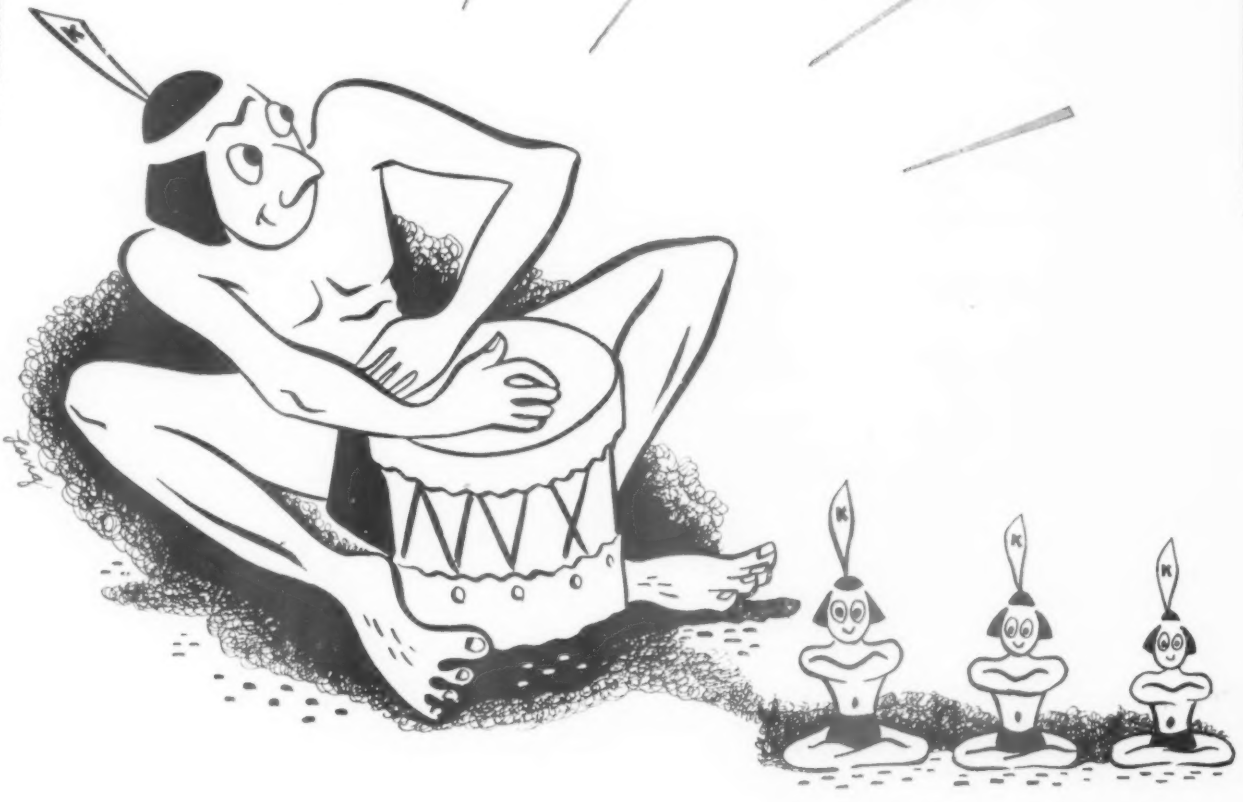
Training and loss prevention must extend beyond the forman. Although it is his responsibility to see that all accident loss prevention rules are enforced, all employees must eventually be trained in safety. Where conditions permit it is of paramount importance that you deliver your message to them in person.

(*Concluded on page* 140)

"take it" from Chief Keokuk

"LOWEST ULTIMATE COST...

...that's Keokuk Electro-Silvery"



When Chief Keokuk says "lowest ultimate cost," he means just that! And Keokuk Electro-Silvery means highest quality and uniformity. The Chief isn't talking through his feathers... he'll prove every word. Write today for complete information.

60-lb. pigs for blocking the open hearth heat.

30-lb. pigs for charging the cupola.

12½-lb. piglets (for foundries) no weighing — charge by count.

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Sales Agents: MILLER AND COMPANY, 332 S. MICHIGAN AVE., Chicago 4, Illinois
3504 Carew Tower, Cincinnati 2, Ohio — 407 N. Eighth Street, St. Louis 1, Missouri

(*Concluded from page* 138)

carefully explaining your reason, the importance of the work, your determination to establish safe working conditions and habits, and the need for their help and cooperation. This announcement should be followed up by a planned educational program including the permanent display of safety posters, the distribution of safety literature, and perhaps by instructive illustrative talks. A rapidly expanding practice is the five-minute weekly safety talk by each foreman to his group of employees.

Carefully Select Employees

There is one phase of proper induction that merits special mention in relation to your trade—the careful selection of employees. Much of foundry work presents severe hazards, many of which may involve a number of men—hazards such as the handling of molten metal, lifting heavy objects, and frequently carrying them past or over other workers. There is also the possibility of the occupational disease of silicosis in foundries. Each employee should be carefully considered in relation to the work which he is to handle, not with any intent to deny a man employment, but rather, to be certain that he is assigned to work that he is physically and mentally qualified to handle without injury to himself or others. Crane men, for example, should have normal vision and reflexes; chain men should have good judgement, keen perception, and be emotionally stable; men who will be required to lift heavy objects should be physically fit to do such work. I am sure you will find it advantageous to examine carefully each applicant and measure his fitness by the requirements of the job. I also feel sure, if you operate a foundry with a silicosis exposure, that pre-employment physical examinations with X-Rays and annual examinations thereafter will pay you big dividends, even though you may be taking all possible other precautions to control such hazards.

These same principles of proper placement apply to the new problem that is presented to all industry in the successful employment of handicapped workers. There are places for such men even in foundries. If each job is thoroughly analyzed to determine the basic requirements and you have an accurate report of the prospective employee's condition, you will be able to offer him congenial work that he can perform; and if your experience parallels that of many plants, you will find the handicapped veteran an appreciative, loyal and efficient worker and a decided influence toward better employee morale.

Personal Interest Essential

In conclusion let me repeat the two main thoughts I have expressed. First, accident loss prevention is practicable; it can be successfully conducted in any plant and will pay dividends in savings, in improved efficiency and increased production rates, in maintaining customer goodwill and in better labor relations. Second, you as operating executives can obtain successful results through your personal interest and leadership—and in no other way.

Work? Sure, it involves work, and so does anything else worth getting. I am certain you will find that the reward of an effective loss prevention program will exceed your expectations and the entailed work will be less than you anticipate.

Approves Peacetime Standards

Important studies in standardization were reported at the 28th annual meeting of the American Standards Association, held in New York, Nov. 21-22, with attendance largest in the history of the organization, amounting to 500 at some sessions.

L. F. Adams, acting chairman of the Standards Council of the association, and manager of the standards division, executive department, General Electric Co., Schenectady, N. Y., pointed out that during the emergency ASA machinery provided the country with 153 standards adopted under its war standards procedure, and that there has been notable progress in reviewing these emergency standards for peacetime use and in the development of new regular standards.

To date reviewing procedure has resulted in the reaffirmation of 15 standards, leaving 138 still to be disposed of. Ninety-eight of the remaining wartime standards, he declared, already are under review by committees but have not as yet reached the approval stage.

Thirty-one new standards not connected with war were approved last year and 13 revised regular standards have been approved, making a total 44. "In the year up to our previous annual meeting, 22 new standards were approved and 21 revised regular standards were adopted," he declared. "Thus while the total of all standards in the last year numbers 53 against 87 in the previous year, the difference is more than accounted for since only nine more standards fall into the current accounting compared with the preceding year."

PANGBORN VISITORS: Seventy-two members of the Baltimore Association of Commerce posed for this group picture during their visit to the plant of Pangborn Corp., Hagerstown, Md., Oct. 25. Welcomed by Thomas W. Pangborn, president, and John C. Pangborn, vice president, the guests were conducted on a complete tour of the company's plant and offices, including two new buildings now in course of construction, and were shown the adjacent Pangborn Park. As a parting souvenir, each guest was presented an illustrated brochure of Pangborn's war production record.

For Accuracy, High Finish and Great Precision, Use These Tested Sterling Wheels

●These Sterling Cylindrical Grinding Wheels produce unsurpassed accuracy and smoothness of the ground surfaces. They readily shape and reduce to required size hard materials that cannot be machined . . . and do it to limits of 0.0001-inch, and better!

Available in any desired grain size and special Sterling bonds, these wheels provide unusual economy and lasting performance. A Sterling engineer will gladly arrange a test in your grinding department, under such conditions as you may specify . . . write us today!

"THE WHEELS OF INDUSTRY"

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● May we send you the Sterling folder on Cyclindrical Grinding specifications? Free for the asking.

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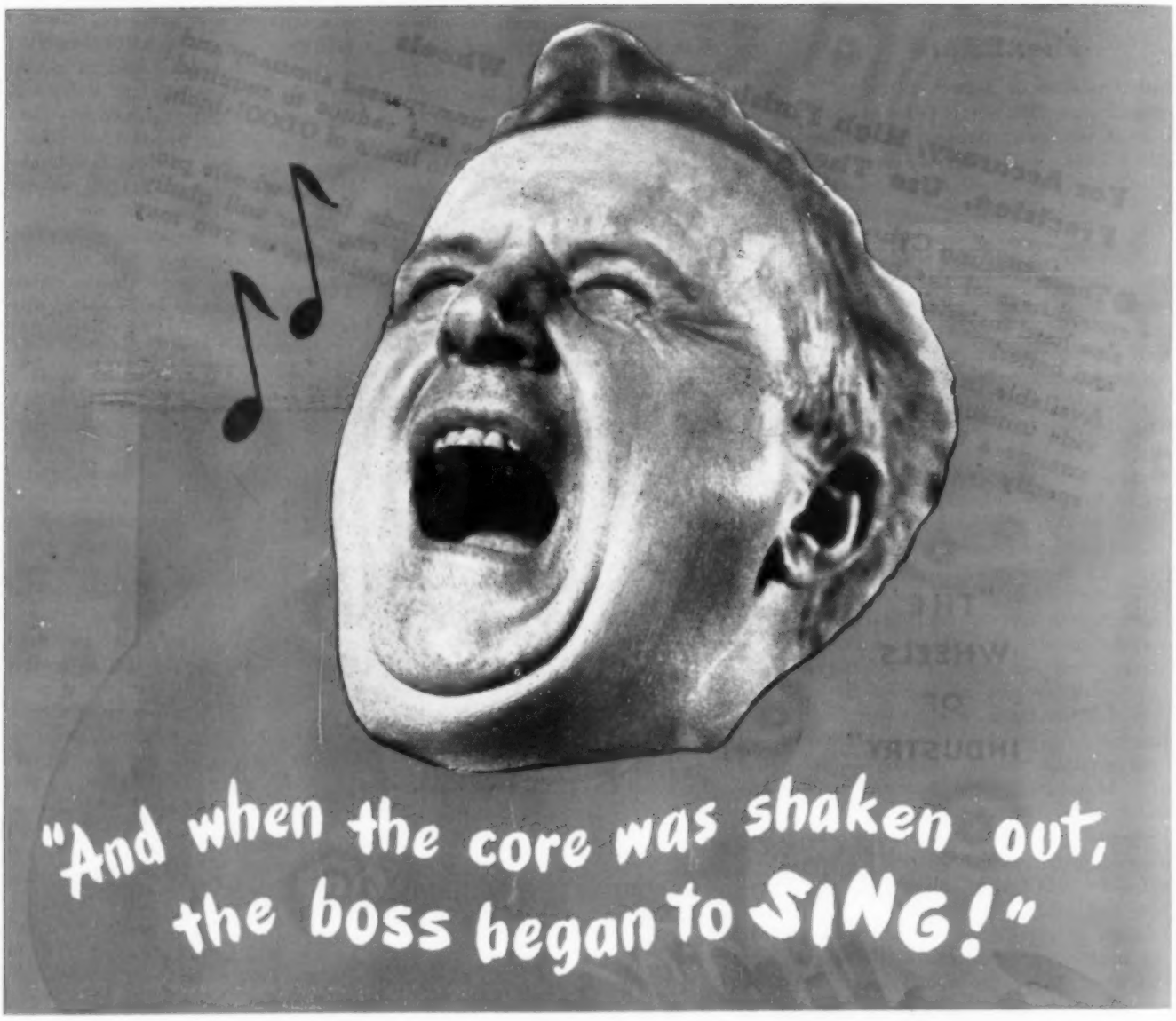

"NEVER saw cores behave so well before. From the time they were nothing but a pile of mix, their behavior has brought joy to the most critical coremaker. Plenty of green strength; better permeability; no sticking; and they collapse like a tired pup on a pillow. Look at these castings! They're smooth and sharp. The whole batch is dog-gone near perfect. And, believe me, that's the way to make core room costs toe the mark.

"We're using Krause Cereal Binders in our coremaking. Some like the lightweight — *TRUSCOR*, the Krause people call it; some like the heavyweight — *AMERIKOR*, by name. My core making troubles flew right out of the window when we started using Krause cereal binders, so I'll pass along a tip — make your choice either lightweight or heavyweight — but just be sure it's a Krause Cereal Binder."

We can't add much more to the boss' story except to remind you that on your next order, ask for Krause cereal binders — *TRUSCOR* for lightweight; *AMERIKOR* for heavyweight. And if you have a core problem that needs solving, phone, write or wire us the details. We'll be glad to help you.

CHAS. A. KRAUSE MILLING CO., Milwaukee 1, Wis. • *World's Largest Millers of Dry Corn*

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M. A. Bell Co., St. Louis 2, Mo.
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Smith-Sharpe Co., Minneapolis 14, Minn.
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Frederic B. Stevens, Inc., Cleveland 14, Ohio
Frederic B. Stevens, Inc., Detroit 26, Mich.

CHICAGO AREA FOUNDRYMEN
Hold Successful Conference

By WILLIAM G. GUDE
Managing Editor
and ROBERT H. HERRMANN
Assistant Editor

APPROXIMATELY 400 foundrymen of the Chicago and near-by areas participated in the Regional Foundry Conference held at the Hotel Continental, Chicago, Nov. 21-22. The meeting was sponsored by the Chicago and Central Illinois Chapters of the American Foundrymen's Association in co-operation with the Illinois Institute of Technology, Northwestern University and the University of Illinois. A well rounded program of papers covering a large variety of foundry practices aroused considerable interest and discussion at the different sessions.

A. W. Gregg, executive engineer, Whiting Corp., Harvey, Ill., was chairman of the committee in charge of the conference, the first regional gathering sponsored by the Chicago group since 1941. The program consisted of two general sessions, two luncheon meetings, a dinner meeting, and two technical sessions for each of the gray iron, malleable iron, steel, nonferrous, and pattern groups.

Advocates Good Housekeeping

The conference was opened Thursday morning with L. H. Hahn, metallurgical supervisor, Sivyer Steel Casting Co., Chicago, and president of the Chicago Chapter, presiding. Dean M. L. Enger, College of Engineering, University of Illinois, Urbana, Ill., spoke briefly, citing the wartime progress in foundry developments and the importance of the casting industry to future economic progress.

Principal speaker at the opening general session was James Thomson, chief works engineer, Continental Foundry & Machine Co., East Chicago, Ind., who discussed "Good Housekeeping and Plant Maintenance." Mr. Thomson declared that improved working conditions constitute an important index of foundry progress, but pointed out that the extent of good housekeeping is measured by the attitude of management. Workers must be indoctrinated with the belief that good housekeeping pays and this can be accomplished only if supervisors are properly instructed in the work, since it is their job to train the workers.

Orderliness, not new equipment, is the first consideration in improving plant working conditions, Mr. Thomson stated. Much can be done in this respect without spending a great deal of money, but after the original clean-up it will then become apparent what new equipment still is needed to do a better job. Mr. Thomson also pointed out that the maintenance department can play an important part in promoting good housekeeping in the foundry, while an orderly plant also assists in providing good maintenance.

In introducing the Thursday luncheon speaker—Dr. H. T. Heald, president, Illinois Institute of Technology, Chicago—F. W. Shipley, foundry manager, Caterpillar Tractor Co., Peoria, Ill., commented that the foundry industry needs an educational program to make people understand that a foundry is a good place in which to work.

In his talk, "Industry's Stake in Education," Dr. Heald stated that education in the United States is a $3 billion business. He added that the progress and production advancement of the United States is due to the increasing level of education, and pointed out some of the problems in the interdependence of education and business. According to Dr. Heald, the supply of engineering graduates will not meet industrial demand again until 1952. To help obtain a supply of trained foundry personnel, Dr. Heald suggested the hiring of students attending co-operative colleges, encouraging part time educational programs and the setting up of company-endowed scholarship funds.

He concluded by saying that university teaching positions should be made as attractive financially as positions in industry in order to attract and keep the highest caliber men.

"The foundry industry is on the threshold of its greatest prosperity and stiffest competition—in quality, not price," said Sheldon V. Wood, national president, American Foundrymen's Association, in a coffee talk at the dinner, Thursday evening. Main speaker of the evening was Clifton Utley, news analyst and staff commentator, National Broadcasting Co., Chicago, whose talk was entitled "Two Worlds," the two worlds meaning the United States and Russia.

Mr. Utley stated that the Russians not only have an inferiority complex, but are suffering from imperialism and communistic missionaryism. Russia wants to convert the entire world to communism and if we can convince her that she can not expand her ideas she may give up and co-operate with us. According to Mr. Utley, she has done this in the past.

He outlined a three-point policy for dealing with Russia and said that it would take at least five years to convince Russia that she is wrong. Fundamentals in his "power policy" to solidify our stand against Russia are:

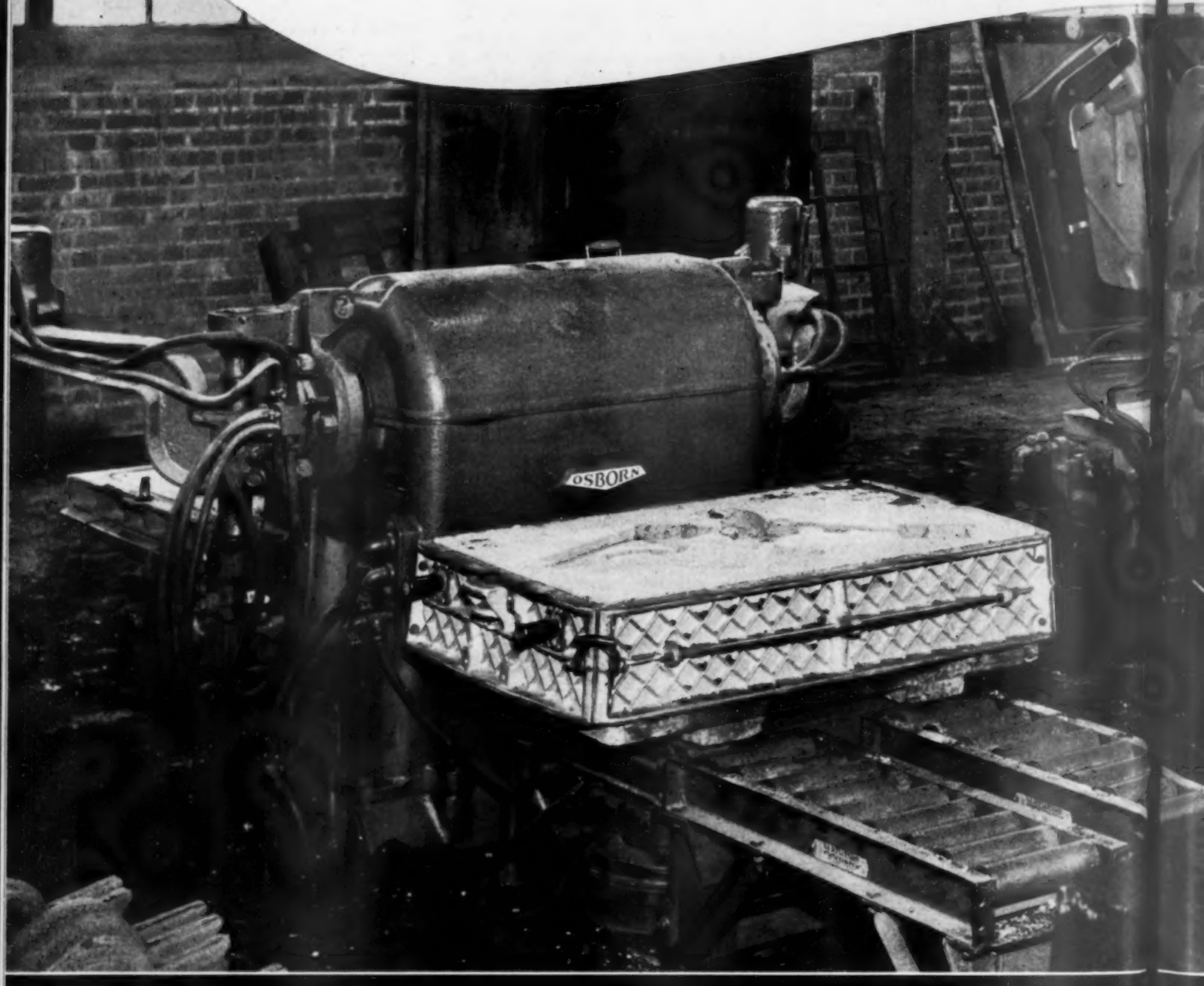
1. The United States must maintain a large armed force, through enlistments if possible, but backed by an effective draft law, and we must keep a strong armed force in Europe. 2. We must continue to make loans to European countries. 3. We must continue food re-

(*Continued on page* 146)

Registration desk at the Chicago Regional Foundry Conference. Approximately 400 foundrymen of the Chicago and nearby areas attended the meeting. (All conference photographs courtesy J. Clyde Thomas, Whiting Corp.)

THESE *OSBORN* JOLT R
help do the job in ½ t

These new-type Osborn Jolt Rockover Pattern Draw ldi as set up at a leading steel foundry, are today produc as in *one* shift as were formerly produced wo



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FOUNDRY EQUIPMENT

Dean M. L. Enger (above), college of Engineering, University of Illinois, speaking at opening session of the conference. Below is shown a group awaiting the dinner, including, in left foreground, Prof. R. G. Bigelow, Northwestern University; F. F. Shoemaker, Illinois Institute of Technology, and E. L. La Grelius, American Steel Foundries

(*Continued from page* 143)

lief.

We must maintain such a firm foreign policy even through any depression for the next five to ten years because any other policy such as Henry Wallace's appeasement policy would lead to a third world war.

Principal speaker at the Friday luncheon meeting was Earl L. Shaner, president of the Penton Publishing Co., Cleveland, who related his experiences on a trip around the world as a member of the United States Reparations Commission. Mr. Shaner discussed industrial and economic conditions as he observed them in the Far East and in Europe, and stressed the need for strengthening the relations between the United States and foreign countries. In closing this session Dr. O. W. Eschbach, Dean, Technological Institute, Northwestern University spoke on the relation between engineering education and industry.

Speakers at the concluding general session, which was devoted to the subject of core blowing, included A. W. Magnuson, Champion Foundry & Machine Co., Chicago, who spoke on "Sands for Core Blowing;" L. D. Pridmore, vice president, International Molding Machine Co., Chicago, who discussed "Core Blowing Equipment;" and Zigmond Madacey, foundry superintendent, Caterpillar Tractor Co., Peoria, Ill., who described "Pattern Equipment for Core Blowing."

In his talk, Mr. Magnuson stated that the sand to use is the one that best suits the foundry's needs. In sand mixing a dry sand should be used so that moisture content can be controlled.

Mr. Pridmore described the five types of core blowing equipment available and pointed out that cores of a few ounces to 250-300 lb can be blown. He added that the greatest green strength of a sand which can be blown is 14.2.

Mr. Madacey stated the foundry industry is a $3 billion business and in the near future will spend heavily for improved working conditions and casting quality. In line with this improvement he said that core quality must be improved and pointed out that blown cores are more accurate than those made on the bench.

In speaking of coreboxes he said that magnesium boxes, in addition to having the advantage of lightness, have shown considerable wear resistance under test.

The opening nonferrous session had W. B. George, metallurgist and foundry engineer, R. Lavin & Sons, Inc., Chicago, as chairman. Opening the session, William A. Gluntz, secretary-treasurer, Gluntz Brass & Aluminum Foundry Co., Cleveland, discussed "Budgeting Foundry Costs" in which he pointed out that inflationary conditions and the uncertainty of worker productivity make it difficult to establish a proper balance between cost and selling prices in the nonferrous foundry industry. Higher casting prices are indicated but should not exceed cost increases, he warned.

In establishing a forecast of sales to draw up a satisfactory budget, co-ordination between the sales, production and purchasing departments is necessary. Mr. Gluntz described a method for establishing a cost budget and also discussed the revised cost system recently compiled by the Non-Ferrous Founders' Society and published in full in the December issue of THE FOUNDRY.

Consider Melting Problems

Walter Edens, technical director, Ampco Metal Inc., Milwaukee, presented the concluding paper at this session, discussing "Melting Problems of Special Bronzes." He described common characteristics of such copper alloys as high aluminum bronze, high copper and high tensile manganese bronze which are used as engineering materials for certain applications because of their special properties. Most problems connected with the production of such castings relate to analysis control, he stated, also listing other factors which affect their efficient production. These include the segregation and classification of all metals, including scrap; use of clean crucibles and furnaces; melting as fast as possible under slightly oxidizing conditions and pouring at as low a temperature as practical; and gating to the lowest possible pouring temperature.

Mr. Edens also pointed out that it is important in the interest of uniformity of metal to duplicate operating conditions as closely as possible from day to day.

Hiram Brown, chief metallurgist, Solar Precision Castings Inc., division of Solar Aircraft Co., Des Moines, Iowa, spoke on "Causes and Elimination of Gas Porosity in Aluminum Castings," at the second nonferorus session. Mr. Brown said that gas porosity results from the liberation of hydrogen from metal as it solidifies. The gas increases in volume as the temperature of the metal increases. The metal, therefore, should not be overheated —above 1450 F.

From the standpoint of reducing gas production, Mr. Brown pointed out that a reducing flame and reverberatory type melting are bad. An oxidizing flame is good.

Hydrogen can be picked up from improper melting, oily scrap, metal exposed to weather where it may adsorb moisture

(*Continued on page* 148)

THE IMPROVED Redford CORE BLOWER

CARTRIDGE BENCH TYPE

Users report remarkable increases in quality and quantity of production.

When making cores from horizontally split boxes, the work of placing driers and drawing the box is done on the base of the machine

Produces variety of intricate cores with unusual speed and simplicity.

Comes ready to use—virtually no installation cost.

Can be operated with unskilled labor—extremely easy to use.

If you make cores 2 lbs. or under—this unit ideally suited to your use.

Designed by practical foundrymen.

WRITE for
complete details and new booklet.

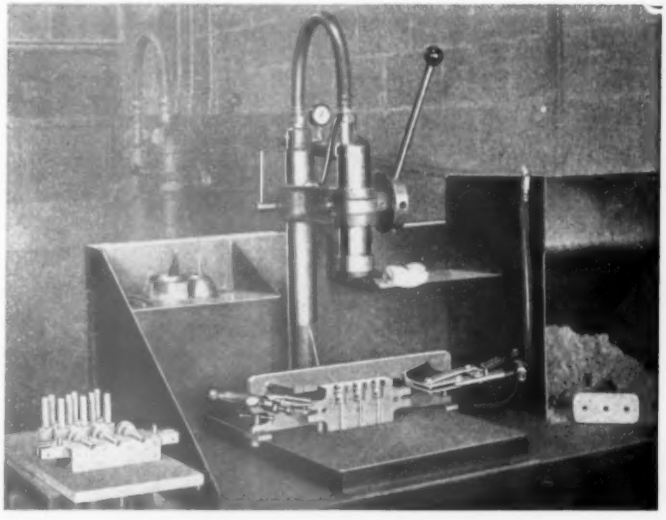
FILLS NEED FOR SIMPLE, FLEXIBLE CORE BLOWER

The New *Redford Bench Core Blower* has met with enthusiastic acceptance by foundrymen because it supplies an important need in the foundry for an efficient, low-cost method of blowing small, intricate cores. It requires no large volume of air and readily lends itself to handling a variety of core boxes. In fact, they tell us that it is the ideal method of making cores in single or gang boxes requiring a maximum of 2 lbs. of sand.

SAND CARTRIDGES AVAILABLE IN 9 STANDARD SIZES

Blower comes complete, ready to use. Each blower provided with one Size "C" sand cartridge which is adaptable to a large range of core boxes. Cartridges are available in eight additional standard sizes and special sizes furnished where needed.

If you have any Core Blowing Problems write or call our Engineering Department. We will change your present equipment for blowing or assist you in designing proper equipment.



The Core Box Clamping Attachment is used when blowing split core boxes vertically (on end). It is quickly adjustable to permit use of different size core boxes. Changeover requires only a few minutes

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(*Continued from page* 146)

and be held by the thin oxide coat which forms, high atmospheric humidity, improper pouring or metal transfer, chemical composition of the metals and very low sand permeability. Preheating of aluminum ingots on top of the furnace opens up the pores and the metal picks up gas. Calcium in aluminum aids in moisture pickup. Mr. Brown added that a slow rate of cooling increases porosity in castings, and that porosity is greater in heavier sections of castings.

He pointed out that dry salt fluxes may help prevent gassing if used as a cover during melting, but for thorough degassing, gaseous fluxes such as nitrogen and chlorine are used. Chlorine fluxes are better particularly where excessive or unusual porosity is present. Excessive degassing, however, with gas fluxes may cause larger grain size and greater shrinkage.

Francis Brewster, metallurgist, foundry division, Dow Chemical Co., Bay City, Mich., discussed "Sand and Its Importance in Nonferrous Casting Production," as the second speaker at this session.

He stated that correct control of moisture and amounts of ingredients in sand is of the utmost importance. All liquids should be metered. Using level-full measures for dry ingredients in mold sand is satisfactory, but core sand ingredients should be weighed because from ½ to 2 per cent of the sand weight is being added, whereas in molding sand seldom more than 0.1 per cent is added at any one reconditioning. He pointed out that a timer should be used to insure the correct sand mixing time.

With reference to drops, Mr. Brewster pointed out that they are often due to lack of plasticity in sand rather than the lack of tension or compression strength. On the matter of blows, he cited his company's practice of maintaining 1.5 per cent glycol in molding sand to keep moisture content below 3 per cent.

An obscure source of blows, according to Mr. Brewster, is water in air lines; it does no good to carefully dry a core and then spray a mist of water on it in the mold. Other sources of trouble are the careless use of liquid parting, and trash in sand. He concluded by saying that sand mixing in the foundry has become complicated and exact with very close control necessary, and foundries are beginning to recognize this importance in their choice of sand mixing men.

° ° °

Ray A. Witschey, ceramic engineer, A. P. Green Firebrick Co., Chicago, discussed "Cupola Refractories" at the first gray iron session Thursday, which was presided over by H. W. Johnson, Wells Mfg. Co., Des Plaines, Ill. Mr. Witschey summarized cupola refractory practice and suggested ways of bettering them.

Refractory failure, according to the speaker, is brought about by thermal, chemical or mechanical causes. High operating heat, which is a function of both temperature and time, softens the refractories and facilitates the chemical and mechanical phases of attack. Chemical attack is occasioned by slag formation and mechanical attack by abrasive action of the descending charge.

Mr. Witschey said that three general maintenance methods are employed: Replacement with fire clay brick, natural silica stone or with monolithic refractory. Irrespective of method used, the complete removal of slag and coke from above the tuyeres and from the area to be repaired is essential to avoid having the patch slip or wash out.

He added that the refractory used should be installed properly and in correct combination to insure tight joints; the use of low fusion, high shrinkage clays in laying up fire clay refractories should be avoided. In daubing mixtures, proper grain size and proper tempering and preparation are important. The driest mixture compatible with proper installation is best since it is subject to less shrinkage.

Cupola Operation Discussed

Concluding this gray iron session, Tom E. Barlow, research engineer, Battelle Memorial Institute, Columbus, O., talked on "Cupola Control and Operation," with C. G. Mate, Greenlee Foundry Co., Chicago, chairman. Mr. Barlow suggested some factors which must be taken into consideration to obtain uniform conditions in daily operation of the cupola.

In his opinion the bed should be measured not only by its height but also by the length of time it has burned, and for correct comparison it should be measured each day at the same time after being lighted. The bed height is also affected by burned lining and this should be considered.

Air is one of the principal materials entering the cupola and Mr. Barlow recommended checking that the proper amount is being used where it is required. The windbox should be inspected to make certain that some tuyeres are not getting more than their share of air at the expense of the others. If blower efficiency is to be maintained it should be protected from dirt and dust, and piping to the cupola should be installed correctly.

"Sand Control" was the subject of a talk by G. W. Anselman, service engineer, Goebig Mineral Supply Co., Chicago, at the second gray iron session, which had H. M. St. John, Crane Co., Chicago, as chairman.

According to Mr. Anselman, the selec-

(*Continued on page* 150)

Dinner meeting at the conference; Clifton Utley, news analyst, speaking

Question? Answer!

¶ Hard lumps at shake-out! They're a nuisance! Can I find a bonding clay reasonably certain to get rid of them?

Remember
NO ONE BONDING CLAY WILL DO ALL JOBS EQUALLY WELL!

¶ You sure can. Dixie Bond has licked this trouble for hundreds of other foundrymen. Too high dry strength is the cause. In Dixie's *moderate* dry strength lies the solution.

¶ No more cracked castings due to sand, therefore — less scrap. Less jolting and good, hard molds. Soft, flowable sand. Drops, swells, cuts? — negligible! Longer flask life — emphatically. Better finish on your castings — increasingly important! Reasons? Dixie Bond has very high green strength, high flowability and the *moderate dry strength* mentioned above.

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¶ Four other bonding clays and many combinations to suit *every* requirement. Bulletins (really informative and authoritative) for the asking.

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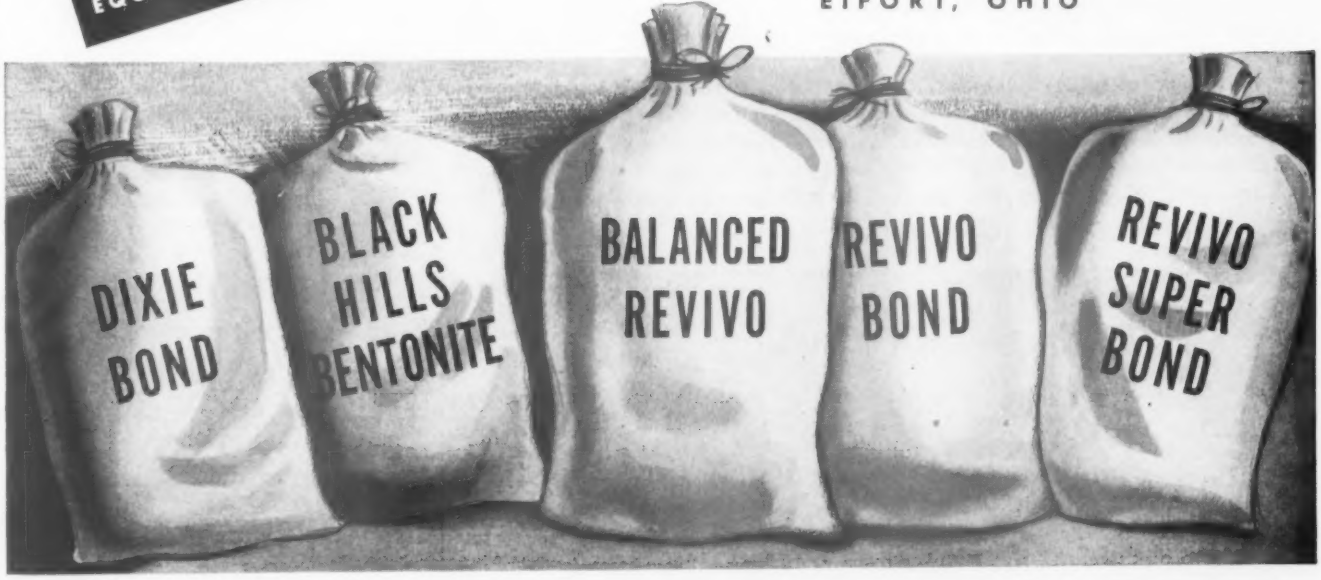

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All TYPES OF BONDING CLAYS

A Foundry Sand Service Based Upon Practical Research

(*Continued from page* 148)

tion of sand according to grain size is the foundation of sand control in the shop. He maintained that the grain size of core sand must match the size of molding sand in order to prevent spreading of the screen analysis when the two are combined and mixed in the shakeout. Lowering of permeability of heap sand is due to spreading the screen analysis.

In selecting clays for molding sand it is necessary to choose clays that will give the desired finish with the proper grain size and put durability second in importance. Also, Mr. Anselman said that clays should be combined so as to give sufficient hot and dry strength to prevent cutting and washing at the gates, but not enough to give serious shakeout trouble.

He added that moisture content of the sand must be controlled and the proper moisture is that point at which the best physical properties can be obtained for all factors, including permeability, green and dry compression, hot strength and deformation. This point varies with different clays and may be determined by testing the sand properties at varying moistures of the sand used. It can also be controlled by studying the metal temperature, total weight of metal poured and time before shakeout. The amount of water evaporated is calculated and added accordingly at the end of the day.

A. Den Breejen, research technician, Hydro-Blast Corp., Chicago, concluded this session with a discussion of "Binders." C. E. McClure, Crane Co., was chairman. Mr. Den Breejen defined a binder as any material which tends to confine or hold together other materials by physical force, and classified foundry binders into: 1. Binders that are soluble or colloidal in water and burn out at relatively low temperatures. 2. Those that are colloidal or dispersed in water but resist high temperature. 3. Oil binders—used principally in core practice. 4. Thermoplastic binders. 5. Special binders—such as rubber cements, silicates and silicon esters.

The best binder to use must be determined by the individual foundryman, according to Mr. Den Breejen. Green stage, dry stage, elevated temperature stage and retained or residual stage, are points which must be considered in selecting the proper binder.

He added that materials such as iron oxide, silica flour, sawdust, wood flour, sea coal, etc., are fillers, not binders, and merely assist the function of binders. In conclusion he said that most of the trouble encountered in the use of binders results from poor mixing and measuring practice, poor drying or baking practice, poor venting and lack of foundry control.

* * *

Leonard F. Tucker, partner, City Pattern Works, South Bend, Ind., spoke on "Co-operation Between the Foundry and the Pattern Shop" to open the first pattern session. He prefaced his talk by commenting that co-operation is essential because without the one industry the other cannot exist. James Gammie, American Steel Foundries, East Chicago, Ind., was chairman.

Patterns are mis-named, according to Mr. Tucker. They are founders' tools, and the castings that come out of the cleaning room are no better than the patterns from which they are produced. Too many patternmakers don't have the foundryman's point of view. They look at a blueprint and see the final pattern, instead of the finished casting.

He suggested that when patterns are to be made the foundry should be consulted to decide upon the many variable factors, including the amount of draft and what to allow for shrinkage.

With reference to pattern costs, Mr. Tucker pointed out that as the industry developed, the cost of castings decreased through mass production and the initial cost of patterns increased. Patterns now must produce more molds.

In speaking of apprentice patternmaker training, Mr. Tucker stated that, today, a period of five years is required for apprentice training and no part of it is in the foundry. In his opinion apprentice patternmakers should have some foundry training. He urged that interested young men enter the AFA apprentice contests and visit the exhibitions of patterns to see what others are doing.

The second talk on patterns dealt with "Pressure Plate and New Pattern Equipment" by Melville E. Kohler, vice president and sales manager, Scientific Cast Products Co., Cleveland. His presentation consisted of a series of slides showing some of the work in plaster molding that his company is doing. Martin Rintz, Continental Foundry & Machine Co., East Chicago, Ind., served as chairman.

Mr. Kohler stated that in plaster molding the plaster is denser at the bottom of deep molds. This is a contributing factor to defective castings and the company is working to eliminate the condition. Brass is the best metal for patterns used in making a plaster mold and cherry is the best wood, according to the speaker.

The second pattern session was given over to a discussion of "Permanent Molds and Equipment," with Vincent J. Sedlon, president, Master Pattern Co., Cleveland, the speaker and H. K. Swanson, Swanson Pattern & Model Works, East Chicago, Ind., chairman. Mr. Sedlon covered his subject from the mold makers' viewpoint, bringing out the various problems encountered in making molds and the experience and facilities required to complete an efficient mold.

Wood and metal pattern making experience is necessary in the building of molds; this experience should be coupled with foundry experience to enable the correct designing of the mold. The use of wood models, which are made in full

(*Continued on page* 152)

Two groups pose for pictures between conference sessions. Group at right includes, left to right: A. W. Gregg and Gen. T. S. Hammond, Whiting Corp.; C. E. Hoyt; R. E. Kennedy; Dean R. P. Hoelscher, Chicago Branch of University of Illinois; Eugene Galvin, Franklin Engineering Associates, and James Thomson, Continental Foundry & Machine Co.

37% say "Bakes Uniformly"

23% say "Increases Production"

22% say "Saves Labor"

16% say "Cuts Baking Costs"

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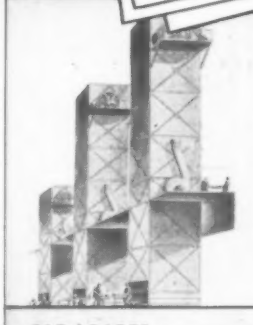
DESPATCH CORE-BAKING OVENS



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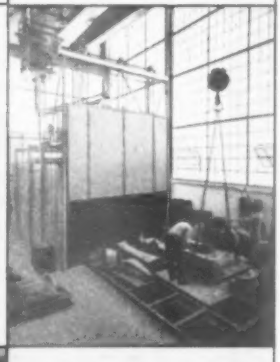

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Ask for Bulletin 32.

Every foundryman using DESPATCH Core-Baking Ovens prefers them because they fit his own special needs *exactly.* This is proved by a recent survey. Foundrymen were asked, "What performance advantage in a DESPATCH Oven is most important to *your* foundry?"

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"Production is important to us," said a foundry superintendent, "but *quality* comes first. There's no use baking a lot of cores if they're not baked right. Our rejects ran as high as 26% before . . . that's why we picked DESPATCH, and we're plenty glad we did!"

> *"Experienced help is still hard to get," said a third foundryman. "So the* labor-saving *features of our DESPATCH Oven mean the most to us."*

These reports are typical of thousands of DESPATCH users. They illustrate how well DESPATCH Ovens meet *all* the needs of the modern foundry.

Your foundry, too, has its own special problems. It may be fast, quality baking . . . easier handling . . . lower baking costs . . . better use of floorspace . . . labor saving . . . added flexibility . . . or a combination of these needs. But whatever your problems are, DESPATCH has the answer.

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DESPATCH OVEN CO., 615 S.E. 8th Street, Minneapolis 14, Minn.

DESPATCH OVEN COMPANY

(*Continued from page* 150)

size, enables the engineer to study and analyze the mold's operation. This study often reveals the necessity for changing the mold while it is in an early process of manufacture. Models are also used for machining the cavities by the follower or duplicating method. The speaker pointed out that a mold is actually a pattern in reverse and that the skill of the pattern-maker is indispensable in the building of molds.

While there is a large demand for castings made by the permanent mold method, there will always be many castings which will remain a preferred sand cast job because of a great deal of coring, unusually large proportions or limited orders which would not warrant the cost of a mold. Those in contact with prospective buyers should be able to advise the purchaser which method to select. This can easily be done by determining the number of castings required, their relative cost when made by mold or sand cast method, and by determining whether or not the improved finish, dimensional uniformity and better physical quality of a permanent mold casting are desirable.

The various designs for permanent molds were well illustrated by a series of slides. Some of the more complicated illustrations showed the infinitude of design necessary in developing of practical and workable machines. The speaker also brought out the need for sturdy construction, citing the fact that these molds are subjected to hard usage in the foundry.

The amount of shrinkage to allow for the casting, the gating, risering, venting, and the necessity of heat treating were discussed at some length.

The use of sand cores in conjunction with permanent molds was also illustrated. These molds, which embody the use of sand cores, are referred to as semi-permanent molds.

Further discussion covered the proving of a completed mold. This necessitates the use of the proper coating, correctly pre-heating the mold and pouring a casting to determine its efficiency and workability. The speaker concluded with the thought that talents and skills are developed by making simple molds and gradually acquiring the necessary experience to enable the successful making of more complicated molds.

° ° °

The first paper at the opening Malleable session was presented by Dr. C. H. Lorig, Battelle Memorial Institute, Columbus, O., on the subject "Metallurgy of Malleable Iron." W. D. McMillan, International Harvester Co., Chicago, was in the chair.

Dr. Lorig discussed the technical factors influencing annealing of hard iron and presented a diagram depicting the temperature-constitution relationship for iron-carbon-silicon alloys in the range of composition for malleable iron. He pointed out that the presence of silicon and other constituents besides carbon causes the diagram to differ somewhat from the usual equilibrium diagram for iron-carbon alloys. Whereas in the iron-carbon diagram there is no interval between the beginning of transformation and the end of transformation, and the eutectoid point is at 0.83 per cent carbon, in malleable iron there is an interval of around 50 F between the beginning and the end of transformation, and the eutectoid point is at about 0.53 per cent carbon. The eutectoid temperature for the malleable used in constructing the diagram is at 1410 F.

The graphitizing process is comprised of two stages, the first to bring about the decomposition of primary cementite and the second to bring about the decomposition of the carbide precipitated from austenite when it transforms to ferrite and pearlite. Through a series of slides Dr. Lorig illustrated the effect of the rate of precipitation on the various constituents.

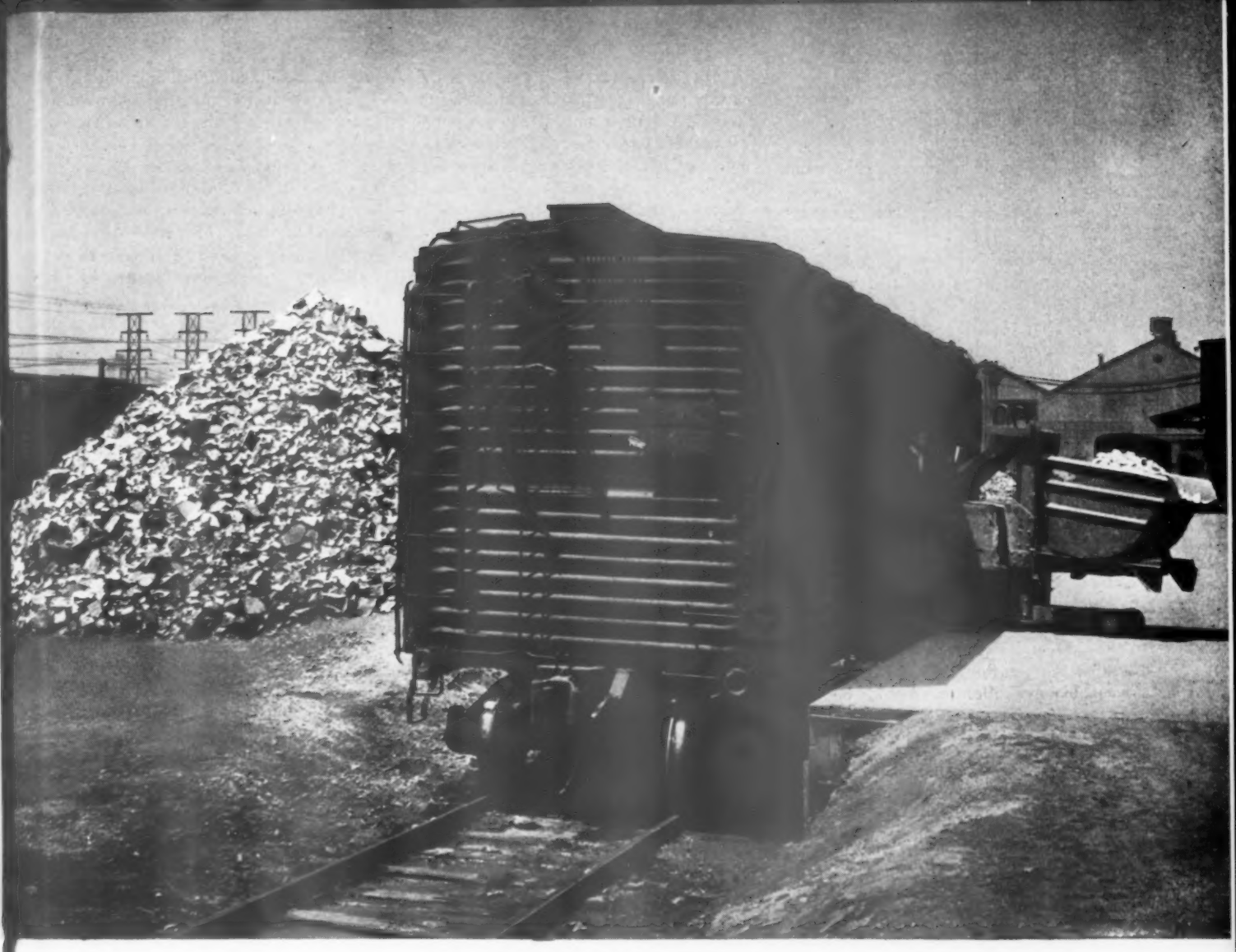
To Improve Malleable Iron

It was pointed out that evidence is on hand favoring the view that the properties, and especially the ductility of malleable iron are further improved if it is held below the critical temperature for a prolonged length of time after graphitization is complete. This would mean either the precipitation or the solution in the ferrite of some constituents which in one way or another affect the properties. If it were precipitated from ferrite, the extended holding time may permit the precipitate to grow until it is rendered harmless, or if it is carbide, to permit it to decompose into iron and graphite. On the other hand, dissolving of the constituents in ferrite when its solubility in austenite or pearlite is limited may also explain the improved ductility. Dr. Lorig concluded his discussion with a brief study of the metallurgy of pearlite malleable iron.

The second paper, entitled "Malleable Gating and Feeding Practice," was presented by J. H. Lansing, Malleable Founders' Society, Cleveland, with B. C. Yearley, National Malleable & Steel Castings Co., Cicero, Ill., presiding. Mr. Lansing indicated that the most essential consideration in the gating and feeding of malleable iron castings is the produc-

(*Concluded on page* 154)

Chicago conference visitors included (center panel) A. H. Stenzel, Stenzel Pattern Works, Houston, Tex., Mr. and Mrs. V. S. Sedlon, Master Pattern Works, Cleveland, and Mr. and Mrs. A. E. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee. Audiences are shown at the opening session (top) and at one of the pattern sessions (bottom)



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(*Concluded from page 132*)

tion of a sound component. To secure soundness, the following factors should be given consideration:

1. The number of pieces in the mold should be such that the greatest number of good pieces can be produced per man-hour.

2. The sprue, or remelt, must be as low in weight as is consistent with the production of good sound castings. Thus the melting, pouring and rehandling of extra material will be avoided.

3. If a gate will be as effective in one location as another, it should be placed in the location in which it will be most easily removed, thus keeping gate removal cost at a minimum.

4. Gating should be such as to favor minimum scrap.

At the same time, feeders should be kept as close as practical to the casting; slag and dirt should be prevented from entering the mold; the height of the sprue, rather than the diameter, should be increased to produce greater pressure, the possibility of using chills to equalize solidification should be considered, and the need for adding fillets to feed an interior section should be studied. Other considerations would be the advantage of countersinking feeder tops to increase effectiveness, the advantage of not pouring directly down upon a skim core, and the desirability of feeding several castings from one feeder if practical.

Describe Annealing Ovens

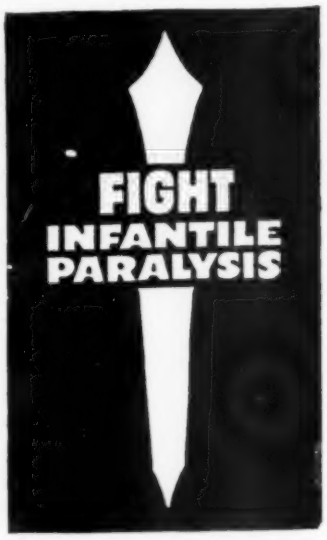
C. R. Taylor, Whiting Corp., Harvey, Ill., discussed "Modern Malleable Annealing" at the Friday morning session, with C. C. Lawson, Wagner Malleable Iron Co., Decatur, Ill., chairman. Mr. Taylor outlined the various types of annealing ovens which are now available and indicated that not any one type of oven will meet all requirements in every malleable foundry. He gave information on fuel cost comparisons with different types of fuels and also described in some detail the various methods of operating annealing furnaces.

In the second paper at this session, W. R. Jaeschke, Whiting Corp., Harvey, Ill., discussed "Modern Malleable Melting." Mr. Jaeschke described the history of duplexing in the malleable industry and indicated the advantages in continuous methods of production made possible through duplex melting. He pointed out that according to the latest figures available, 35 existing malleable foundries have duplex melting equipment and are in the process of starting operation.

In discussing operations he stated that in malleable duplexing, most cupolas operate with an iron to coke ratio of from 9 to 1, to 11 to 1. The color of the cupola slag is a good indication as to whether the right amount of coke is being used. Light color slag indicates too much coke and black slag shows that there is danger of running into excessive oxidizing conditions. A bottle green is a normal color of slag.

"Nonmetallic Inclusions in Steel Castings" was the subject of the first paper presented at the opening steel session by F. W. Boulger, assistant supervisor of metallurgy, Battelle Memorial Institute, Columbus, O., F. B. Skeates, foundry superintendent, Link-Belt Co., Chicago, was chairman.

Nonmetallic inclusions will be found in any steel specimen if it is examined



MARCH OF DIMES
JANUARY 15-30

closely enough, according to Mr. Boulger. The presence of inclusions is natural and they may be harmless, beneficial or deleterious.

Inclusions are of two primary origins: 1. Accidental—from refractories, etc. 2. Natural—from the steelmaking process.

High grade refractories (low in silica), high pouring temperatures (to allow inclusions to float out), good pouring and mold practice will reduce the number of accidental inclusions.

Sulphides constitute more than half of the natural inclusions found in steel. Therefore, the greatest contribution toward steel cleanliness is a reduction in the sulphur content.

Distribution of the sulphides can be controlled by the type and amount of the deoxidizer added to the steel. Approximately 0.02 per cent of residual aluminum or 0.03 per cent total zirconium is usually the lower limit for safety. Titanium should be used sparingly. When present in excess of 0.025 per cent titanium causes an embrittling network of sulphide films. Sulphides have a harmless distribution in silicon-killed steels, regardless of the amount of silicon present.

The concluding paper at this session was by J. K. McDowell, welding engineer, Rock Island Arsenal, Rock Island, Ill., on "Welding of Steel Castings—Stress Relieving and Testing." E. L. LaGrelius, resident metallurgist, American Steel Foundries, East Chicago, Ind., was chairman.

Mr. McDowell described a test developed at Rock Island Arsenal for weldability based upon the maximum hardness developed in a weld bead made under closely specified conditions. A section through the weld bead is surveyed using the Vickers hardness tester. If a reading of over 465 is obtained, the steel is considered to have unsatisfactory weldability. The maximum weld bead hardness can be estimated as equal to:

$$H = 1000\left[\left(C + \frac{Mn}{6}\right) + (Ni - 0.5)\ (0.06)\right]$$

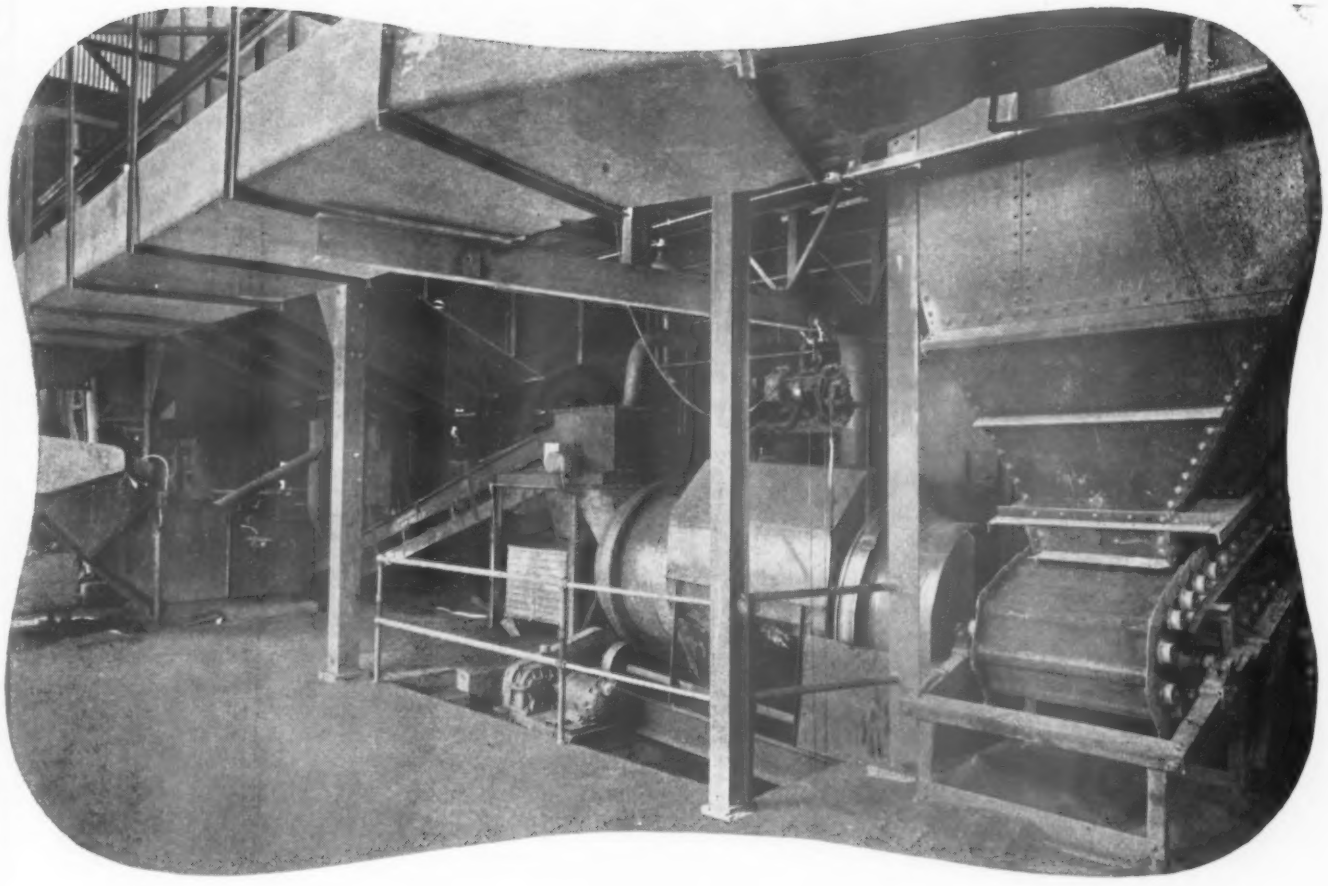
The section used for the hardness survey is also examined at 100X for underbead cracking. By maintaining the proper weldability in the steel, one can eliminate much of preheating.

Consider Chemical Composition

In prescribing a postheat or stress-relieving treatment, it is impractical to give a formula but the metallurgist must consider the chemical composition of the steel, restraint to the contraction, section size, size and type of electrode, speed of travel, member and size of passes. The electrode coating controls the weld, atmosphere and the amount of cracking.

A comprehensive review of the subject of "Hardenability of Steel Castings" was presented at the second steel session by E. J. Wellauer, metallurgist, Falk Corp., Milwaukee. R. E. Kerr, Metallurgist, Pettibone-Mulliken Corp., Chicago, was chairman. Mr. Wellauer presented a number of charts to illustrate and discuss the relation between tensile strength and hardness values, the ratio of toughness and ductility to hardness, effect of inclusions on impact strength, the influence of cooling rates in quenching, and variations in grain size characteristics with different quenching temperatures and different soaking periods.

The speaker stated that both chemistry and hardness should be included in specifications for steel castings, adding that this subject of hardness will increasingly concern foundries in the future. This is particularly true in the case of irregular shapes where variations in hardness of different size sections cause trouble in machinability.



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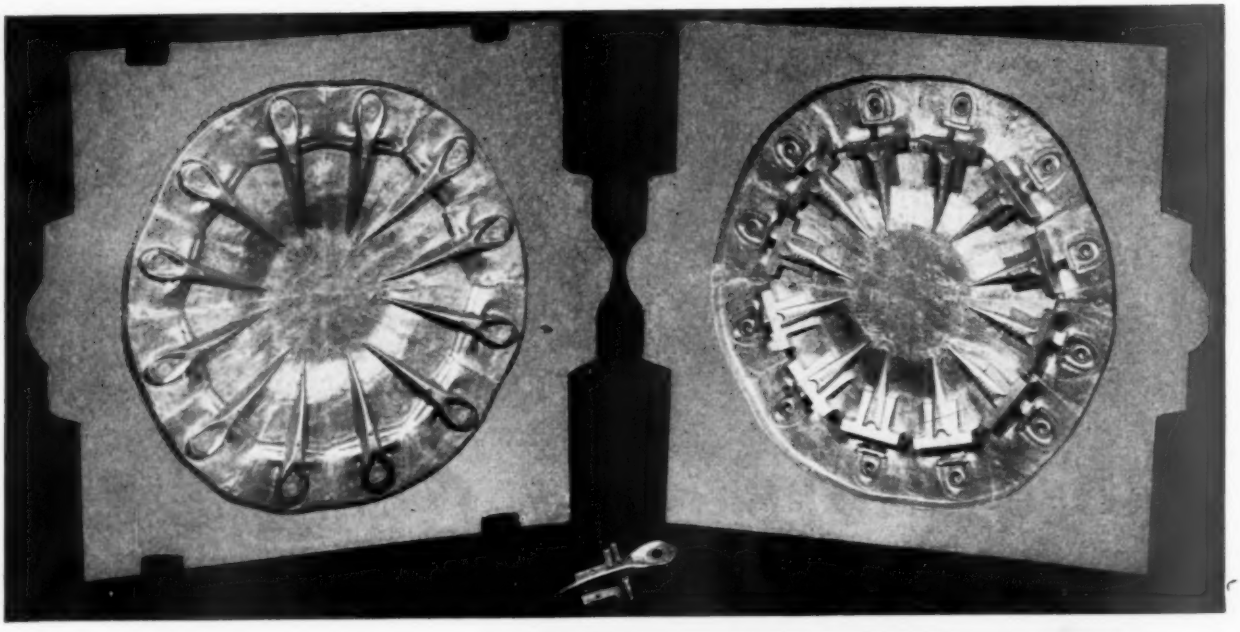

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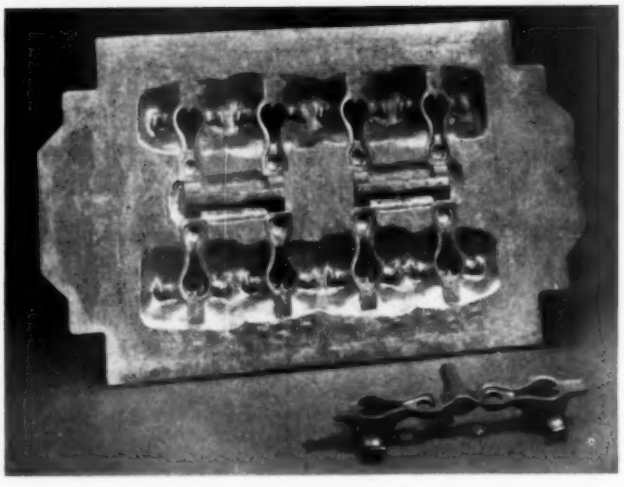

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OBITUARY

HERBERT W. YOUNG, 71, founder and president, Delta-Star Electric Co., Chicago, died Nov. 25. Before organizing the company in 1908, he was in the sales and engineering departments of Westinghouse Electric Corp., in Boston.

° ° °

Norris Whitcraft, connected with Bingham & Taylor, Buffalo, for over 20 years died Nov. 10 after a long illness in a Washington hospital. A veteran of World War I, he was buried with full military honors in Arlington cemetery.

° ° °

Harry Selker, 65, treasurer and general manager, Brass Products Mfg. Co., Cleveland, died Nov. 13 in that city. Mr. Selker, who founded the company in 1935, had been in the foundry business for 35 years.

° ° °

Irving L. Jones, president, International Heater Co., Utica, N. Y., died there recently. Mr. Jones joined the company as an office boy in 1896, when the firm was known as Russell Wheeler & Sons Co.

° ° °

Gilbert McMurtrie, 54, vice president and treasurer, Terre Haute Malleable & Mfg. Corp., Terre Haute, Ind., died there recently.

° ° °

Arthur P. Stephenson, 69, for many years Indianapolis plant treasurer, National Malleable & Steel Castings Co., died recently at his home in that city.

° ° °

George A. Harper, 75, president, Burlington Brass Works, Burlington, Wis., died recently.

° ° °

Ernest R. Knecht, 49, secretary Atlantic Foundry Co., 182 Beaver St., Akron, O., died Oct. 5. He had been ill a year.

° ° °

Henry J. Noble Sr., 56, works manager, American Cast Iron Pipe Co., Birmingham, died Nov. 20, after a long illness.

Pick Committees For AFA Sand Division

P. E. Kyle, professor of applied metallurgy, Cornell University, Ithaca, N. Y., has been appointed head of the flowability committee, sand division, American Foundrymen's Association. W. G. Parker, sand technician, Elmira Foundry Co., Elmira, N. Y., is vice chairman. Other members are: H. W. Dietert, president, Harry W. Dietert Co., Detroit; N. H. Keyser, metallurgist, Battelle Memorial Institute, Columbus, O. and D. F. Sawtelle, metallurgist, Malleable Iron Fittings Co., Branford, Conn.

The grading and fineness committee includes R. E. Morey, metallurgist, U. S. Naval Research Laboratory, Washington, chairman; H. J. Williams, sales manager, New Jersey Silica Sand Co., Millville, N. J., vice chairman; B. H. Booth, foundry engineer, Carpenter Bros., Milwaukee, secretary; A. I. Krynitsky, chief, experimental foundry, National Bureau of Standards, and Stanton Walker, consulting engineer, National Industrial Sand Association, both of Washington, and E. C. Zirzow, coreroom foreman, National Malleable & Steel Castings Co., Cleveland.

Book Review

Safety Directory, published by Alfred M. Best Co. Inc., New York, cloth, 351 pages, 8½ x 11 in. Price $5.

Containing within one volume information on over one thousand products, devices and equipment used in safety, first-aid, hygiene, health conservation and fire protection, this book is the first complete reference of its kind. It tells what safety product to use, when to use it, how to use it and where to get it. The book is cross-indexed containing a comprehensive, topical index which facilitates reference.

Heating, Ventilating Engineers To Meet

Seventh International Heating and Ventilating Exposition will be held in Cleveland's Lakeside Hall, Jan. 27-31. Said to be the largest exposition of its kind ever held, it will have approximately 400 exhibits staged mostly by long established manufacturers of private and industrial heating and ventilating equipment. Many new developments in the field will be displayed.

The exposition is sponsored by the American Society of Heating and Ventilating Engineers, Cleveland, which will hold its annual meeting at the same time. Among other professional and commercial groups meeting during the exposition will be the National Warm Air Heating and Air Conditioning Association.

SNAGGING: Grinding a steel casting with the new 32 Alundum wheel developed by the Norton Co. Employing a new aluminum oxide abrasive in which the grains are formed as individual crystals of a chunky shape with many angles, the wheels are said to be especially suited to foundry applications

Activities of Foundry GROUPS

Washington

ESTABLISHMENT at Seattle of a Washington chapter of the AFA has been approved by the national board of directors in response to a petition signed by 72 Pacific Northwest foundrymen representing 36 companies.

The new chapter, AFA's fourth on the Pacific coast and 34th in North America, was organized Oct. 3 at a Seattle meeting at which Sheldon V. Wood, president of the association, W. W. Maloney, secretary-treasurer, and W. R. Pindell of Northwest Foundry & Furnace Works Inc., Portland, Oregon Chapter chairman, were guest speakers.

Officers of the Washington Chapter, elected unanimously at the organization meeting, are C. M. Anderson, Eagle Brass Foundry Co., chairman; George M. Rauen, Olympic Foundry Co., vice chairman, and A. D. Cummings, Western Foundry Sand Co., secretary-treasurer. They are located in Seattle.

Directors named to serve until the first regular election include G. S. Schaller, University of Washington; C. W. Summerville, Seattle Brass Co., and J. D. Tracy, Salmon Bay Foundry Co., all of Seattle; E. D. Boyle, Puget Sound Naval Shipyard, Bremerton; V. C. Cretan, Atlas Foundry & Machine Co., Tacoma, and Howard Heath, Summer Iron Works, Everett.

Interest in an AFA chapter in the Pacific Northwest became increasingly evident over the past year and many of the group's chapter members traveled 100 miles and more to attend the organization meeting, according to Mr. Maloney.

Canton

APPROXIMATELY 80 members and guests of the Canton District Chapter of the AFA attended a dinner meeting at the Elks Club, Alliance, O., Nov. 14. During the brief business meeting which preceded a series of round-table discussions, the educational committee announced its attempt to set up a uniform course in apprentice training in the foundry industry in co-operation with Ohio public schools.

Round-table topics and their leaders were: Patterns—Theodore M. Dubs, Canton Pattern & Mfg. Co., Canton, O.; iron—Lewis Way, Columbiana Foundry Co., Columbiana, O.; steel—C. B. Williams, Massillon Steel Castings Co., Massillon, O.; nonferrous—Ernest Hess, retired and past president of the Northeastern Ohio Chapter; and time study—Mr. McFall, American Steel Foundries, Alliance.

Charles B. Schureman, consulting foundry engineer, spoke on "Foundry Sands" at the Oct. 10 meeting at the Sue Ming Restaurant, Canton. He covered the subjects of base sands, addition of bonds and milling time. He also discussed baking time and temperature of cores and ended his talk with the remark, "You do not bake your cores long enough."—*Nils E. Moore, reporter.*

Reading

BRUCE EDRIS, Berks Foundry & Mfg. Co., West Hamburg, Pa., was elected president of the Reading Foundrymen's Association for 1947 at a recent meeting at the Berkshire Hotel, Reading, Pa.

He succeeds Robert P. Fritch, president, Union Bronze Co. Inc., Reading. Other officers are D. G. Burkert, vice president, and Werner Finster, treasurer. Named to the executive board were William M. Davies, Hermann P. Good, Paul Harner, Elmer E. McKinney, George Schomo, B. M. Staley, Ivan M. Stone and Mr. Fritch.

Mr. Good, entertainment committee chairman, reported that plans have been completed for the Eighth Annual Christmas Party to be held at the Berkshire Hotel.

A demonstration on the use of core blowing equipment to overcome the shortage of skilled coremakers was given by J. Howard Ware, general sales manager, Redford Iron & Equipment Co., Detroit. According to Mr. Ware, production can be speeded up and smoother castings obtained by the new method.

(*Continued on page* 161)

CENTRAL ILLINOIS: Picture at left shows A. V. Martens (lef t), president, Pekin Foundry & Machine Co. and vice chairman, Central Illinois Chapter, and A. F. Pfeifer (right), foundry and pattern division, Allis-Chalmers Mfg. Co., speaker at recent chapter meeting. Picture at right shows Central Illinois Chapter officials. Left to right, lower row—V. W. A'Hearn, director; G. H. Rockwell, secretary-treasurer; Z. Madacey, chairman, and A. V. Martens, vice-chairman. Upper row—F. W. Shipley, program chairman and director; L. E. Roby, C. W. Bucklar and A. Klawitter, directors. Prof. C. E. Schubert, director, is not shown. (Pictures courtesy of Caterpillar Tractor Co.)

MOGUL is a perfect Green Bond, which increases permeability in cores. Use MOGUL in cores for both green and dry strength.

MOGUL works with core oil because it decreases drying time and yields smooth cores. MOGUL works perfectly with pitch or rosin, too, because cores can be handled while still warm. MOGUL is widely used with sharp sands.

KORDEK

KORDEK is a perfect DRY BOND. It can be used in smaller quantities than most dry binders. KORDEK produces better castings with fewer discards.

CORN PRODUCTS SALES CO.
17 BATTERY PLACE · NEW YORK 4, N. Y.

ANOTHER REASON *Why* **MILWAUKEE**

JOLT SQUEEZERS

GIVE YOU *Better Molds . . . and More of 'em!*

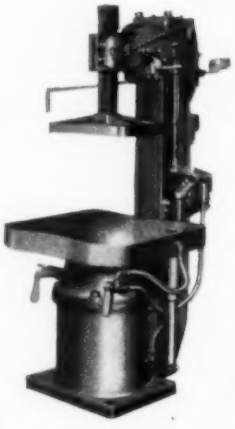
ORIGINAL PARALLELISM BETWEEN PLATEN and TABLE *Always Maintained!*

No. 103
Stationary Jolt Squeezer with 10" squeezing piston. Accessible from 3 sides.

Milwaukee Jolt Squeezers give you the accuracy you need at all times to get better molds . . . and more of 'em! Platen and table are kept in alignment because they are designed to maintain original parallelism regardless of hinge pin wear. This construction makes ram-offs impossible! Milwaukee Jolt Squeezers are ruggedly built and easy to operate. Intensity of jolt for light or heavy molds is easily controlled by simply turning a choke screw in the side of the jolt valve. When working in a wide range of pressures, squeeze accuracy is maintained by operating a conveniently located squeeze valve handle. Upkeep is low because renewable surfaces are provided at wearing points to simplify and reduce maintenance.

Satisfy yourself of the superior performance of Milwaukee Jolt Squeezers . . . compare them point for point with other similar machines.

New Bulletin No. 118. Gives complete description and specifications of Milwaukee Jolt Squeezers. Send for your copy.



No. 142JS
Stationary Jolt Squeezer with 14" squeezing piston. Not available in portable type.

No. 124
Portable Jolt Squeezer with 12" squeezing piston, steel wheels and mold shelf.

MILWAUKEE *Foundry Equipment Co.*

3238 W. PIERCE STREET, MILWAUKEE 4, WISCONSIN, U.S.A.

(*Continued from page* 158)

On small and medium castings the work would be difficult to duplicate by hand. He added that cores are made by injecting sand into the core box under 80 to 120 pounds pressure, with the exact pressure used being determined by humidity and the type of sand used.—*W. J. Cassidy, secretary.*

Chicago

FOR its third meeting of the 1946-47 season, held at the Chicago Bar Association, Dec. 2, the Chicago Chapter of the AFA conducted a pattern panel, sponsored by the pattern division. A good attendance demonstrated that foundrymen well recognize the necessity for good patterns if good castings are to be produced.

Chapter President L. H. Hahn, metallurgical supervisor, Sivyer Steel Casting Co., Chicago, presided at the dinner portion of the meeting. James Mikuta, superintendent, Manufacturers Brass Foundry Co., Chicago, was technical chairman, and in this capacity conducted the panel session.

Panel members were Chapter Vice President Fred B. Skeates, foundry superintendent, Link-Belt Co., Richard Chorley, sales representative, Manufacturers Brass Foundry Co.; and Martin Rintz, foundry superintendent, Continental Foundry & Machine Co., East Chicago, Ind.

Mr. Skeates spoke first and developed the keynote of "Pattern Shop and Foundry Co-ordination." Involved in the co-operation required are the customer, the patternmaker and the foundryman. Currently, foundries are loaded with business and perhaps co-operation is not all it should be, but, Mr. Skeates warned, the time is not far off when foundries will be looking for business, and then good patterns will assume greater importance because of the competitive and cost angle. The speaker enumerated some of the qualities which foundries desire in patterns.

Specifically, Mr. Skeates mentioned coreboxes. Frequently a customer will provide a single small corebox, when the casting run is of a volume to make fast production of cores desirable. He suggests that through adequate co-operation between the customer and the foundry it would have been determined that economies were to be gained by making cores in multiple, possibly by core blowing procedure. An understanding on this point would have suggested making the proper kind and size of corebox.

Mr. Chorley devoted his discussion to patterns for brass and aluminum castings and Mr. Rintz his remarks to steel castings.

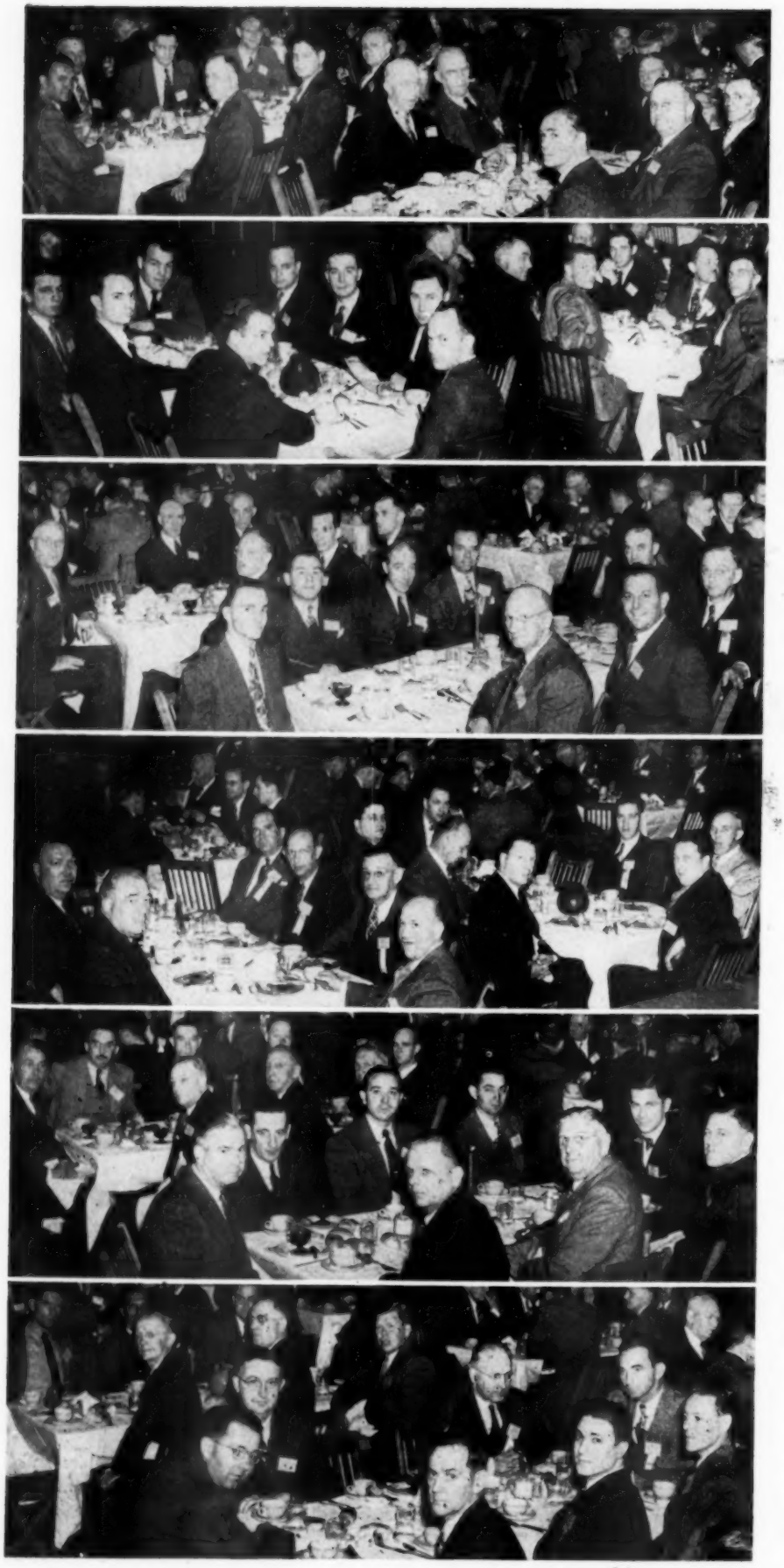
Discussion brought out that foundrymen who have first-hand experience in patternmaking have better appreciation of the part patterns play in making good castings. It also emphasized that foundries are handicapped by the shortage of good molders. This makes even more important the necessity for adequate and good patterns. Progress in this direction is being made, but only more co-operation between customers, patternmakers and foundrymen can further this progress. Speakers emphasized this point.

Next meeting of the chapter on Jan. 6 will feature the second in the series of round tables with group sessions sponsored by the gray iron, malleable, nonferrous and steel divisions.—*Erle F. Ross.*

Northwestern Pa.

MEMBERS of the Northwestern Pennsylvania Chapter of the AFA heard Clyde A. Sanders, American Colloid Co., Chicago, talk on "Rockets in World War II" at the Moose Club, Erie Pa., Nov. 25. Mr. Sanders gave an interesting presentation with slides and movies to illustrate his talk. One of his most interesting comments was that if the

BIRMINGHAM: H. H. Berresford, managing director, Staveley Coal & Iron Co. Ltd., Chesterfield, England, shown in top panel addressing the Nov. 8 meeting of the Birmingham District Chapter, AFA. Center panel shows, left to right: Dr. J. T. MacKenzie, American Cast Iron Pipe Co.; Mr. Berresford; Dr. J. E. Hurst, director of research, Staveley Coal & Iron Co. Ltd.; T. H. Benners, Jr., Woodward Iron Co., chapter chairman; Fred K. Brown, Adams, Rowe & Norman Inc., chapter secretary-treasurer; W. E. Jones, Stockham Pipe Fittings Co., chapter vice chairman. Bottom panel shows the general attendance at the meeting



Some of the 500 participants in the recent Regional Foundrymen's Conference held in Philadelphia under sponsorship of the Metropolitan New York, Philadelphia and Chesapeake Chapters of the AFA

V2 rocket had been capped with an atomic bomb, Germany would have been able to win the war.

The technical discussion centered around foundry problems. In discussing leadership in industry, Mr. Sanders pointed out that tact in handling men is essential—the boss must be one of the boys. He added that getting men to follow instructions is a primary problem.

Mr. Sanders maintains that good equipment is essential in the modern foundry, and that sand control has made us able to analyze our defective castings. —*John E. Gill.*

Birmingham

PLAN your program well ahead, get a good speaker and ask the membership to come," is the slogan used by Tom H. Benners Jr., chairman, Birmingham District Chapter of the AFA, and W. E. Jones, vice chairman, to get good attendance at meetings. Over 125 members heard talks by Dr. J. E. Hurst and H. H. Berresford, outstanding British industrialists, at the meeting, Nov. 8, in Birmingham.

Dr. Hurst, internationally known metallurgist, is a past president of the Institute of British Foundrymen and of Staffordshire Iron and Steel Institute, and is the author of several books, two of which are *Melting Iron In the Cupola* and *Metallurgy of Cast Iron*. He is an honorary doctor of metallurgy from Sheffield University, Sheffield, England.

Mr. Berresford is managing director, Staveley Coal & Iron Co., Chesterfield, England, and Dr. Hurst is director of research.

During his dinner meeting talk, Mr. Berresford said that under the present socialistic government in Britain the output of coal is steadily going down and absenteeism is going up. He added that the nation is facing a rising price in coal which will be a threat to the entire iron and steel industry. He spoke disparagingly of the government's policy of taking over and operating some of the country's industries.

Dr. Hurst in his talk cited the difficulty faced by his and other industries in Great Britain during the war of blacking out plants and said that measures toward that end cost industry "many million pounds." He praised the United States for the aid given industry in Britain by shipments of scarce materials during the war. In an aside from his speech, he praised the conduct of the United States soldiers in England, and said that actual figures would substantiate their good conduct record.

Mr. Berresford was introduced at the dinner by Dr. James T. Mackenzie, chief metallurgist, American Cast Iron Pipe

(*Continued on page* 165)

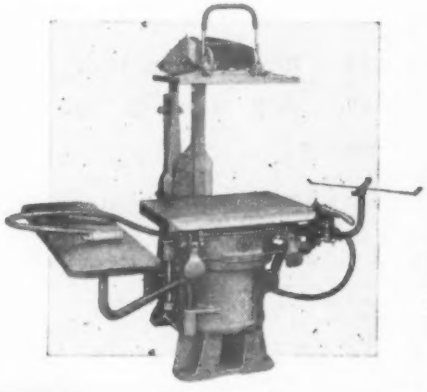
SPO SPECIALIZES, TOO!

To the layman, a watchmaker's work is very much one of the fine arts. It certainly is specialization.

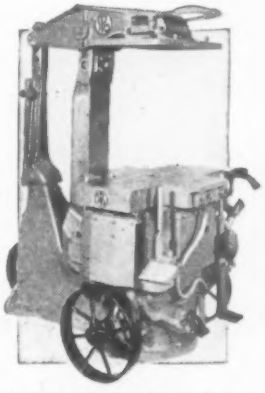
Your investment can just as well bring you simplicity of design as not. "Elaborate," complicated molding equipment does *not* give you more for your money. Actually, it gives you less because there's a potential headache in every "gadget"—maintenance down time, lowered production, increased cost.

The SPOs pictured here embody simplicity of design. You can count on them for high production, accurate molds, unusual versatility and very low maintenance. SPO specializes to this end.

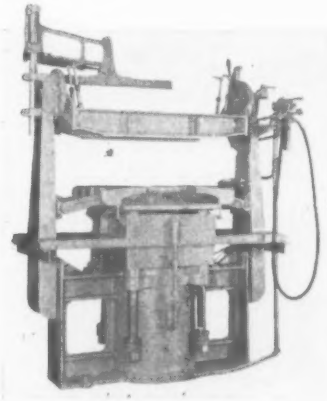
Ask for bulletins on any of the machines illustrated below.



No. 100 Series. Jolt squeezer machines for those gated patterns or matchplate jobs. Post type and portable models.



No. 200 Series. Jolt squeeze stripper machines. Ideal for production of cope or drag molds.



No. 900 Series. Jolt roll-over squeeze draw machines with mold run-out conveyor for fast production of good drag molds.

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Manufacturers and Specialists in Molding Machines, Vibrators and Patterns for Production

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JISCO SILVERY

A PURE PIG IRON

made in the

BLAST FURNACE

from Virgin Ores

HIGH SILICON IRON
JISCO

☆ *Contains No Scrap Metal*

☆ *Physically and Chemically Clean*

Jisco Silvery is the "Tailor Made" iron. It blends with your gray iron, malleable iron and steel scrap to produce castings of uniform quality that are tough, close grained and easily machined.

The foundryman selects the melting stock to give the desired carbon content and adds sufficient Jisco Silvery to supply the necessary silicon.

Jisco is a necessity in today's foundry practice. May we give you complete information?

Consult our Metallurgical Department.

From a message by Andrew Jackson to the Congress.

"It is time to pause in our career, to review our principles, and if possible, rev ve that devoted patriotism, and spirit of comr ɔ-mise, which distinguished the sages of the Revo ution and the athers of our Union."

THE JACKSON IRON & STEEL *Company*

JACKSON, OHIO.

(*Continued from page* 162)

Co., Birmingham, who has visited in Chesterfield on several occasions. Dr. Hurst was introduced at the technical session by W. O. McMahon, foundry consultant, Birmingham.

An exchange of technical papers between the Birmingham, England, IBF and Birmingham, Ala., AFA, groups was suggested by Dr. Hurst and will be worked out by Chairman Benners.

It is planned to have N. J. Dunbeck, vice president, Eastern Clay Products Inc., Eifort, O., speak at the Jan. 17 meeting.—*J. P. McClendon, publicity chairman.*

New Jersey

FOUNDRY modernization means modern thinking along lines of management, marketing, sales and production as well as modernization of equipment and other facilities, Lester B. Knight, Lester B. Knight & Associates, Chicago, declared at a meeting of the New Jersey Foundrymen's Association at the Newark Athletic Club, Newark, N. J., Nov 25.

He listed what he believed to be the major steps in foundry modernization in the following order of their importance: (1) Organization; (2) procedure and methods; (3) costs; and (4) facilities. Organization, he emphasized, comes ahead of all else.

Max Traum, president, Sacks-Barlow Foundries Inc., Newark, newly elected head of the association, succeeding the retiring president, M. J. Hogan, manager, Bierman-Everett Foundry Co., Irvington, N. J., presided at the meeting, which was attended by more than 80 members and guests.

Discussing various steps in the proper modernization of a foundry, Mr. Knight stressed the importance of a simplified organization, with no overlapping of responsibility. He also suggested the desirability of an advisory group, consisting of men thoroughly converant with the work in various departments, to assist the managing executive. Such group or committee would prevent troubles which frequently arise, he believed.

Commenting on costs, he emphasized, among other things, the need for particular attention to pattern making and rigging. The best mechanical equipment available, he asserted, will not offset faulty work in the pattern and rigging departments.

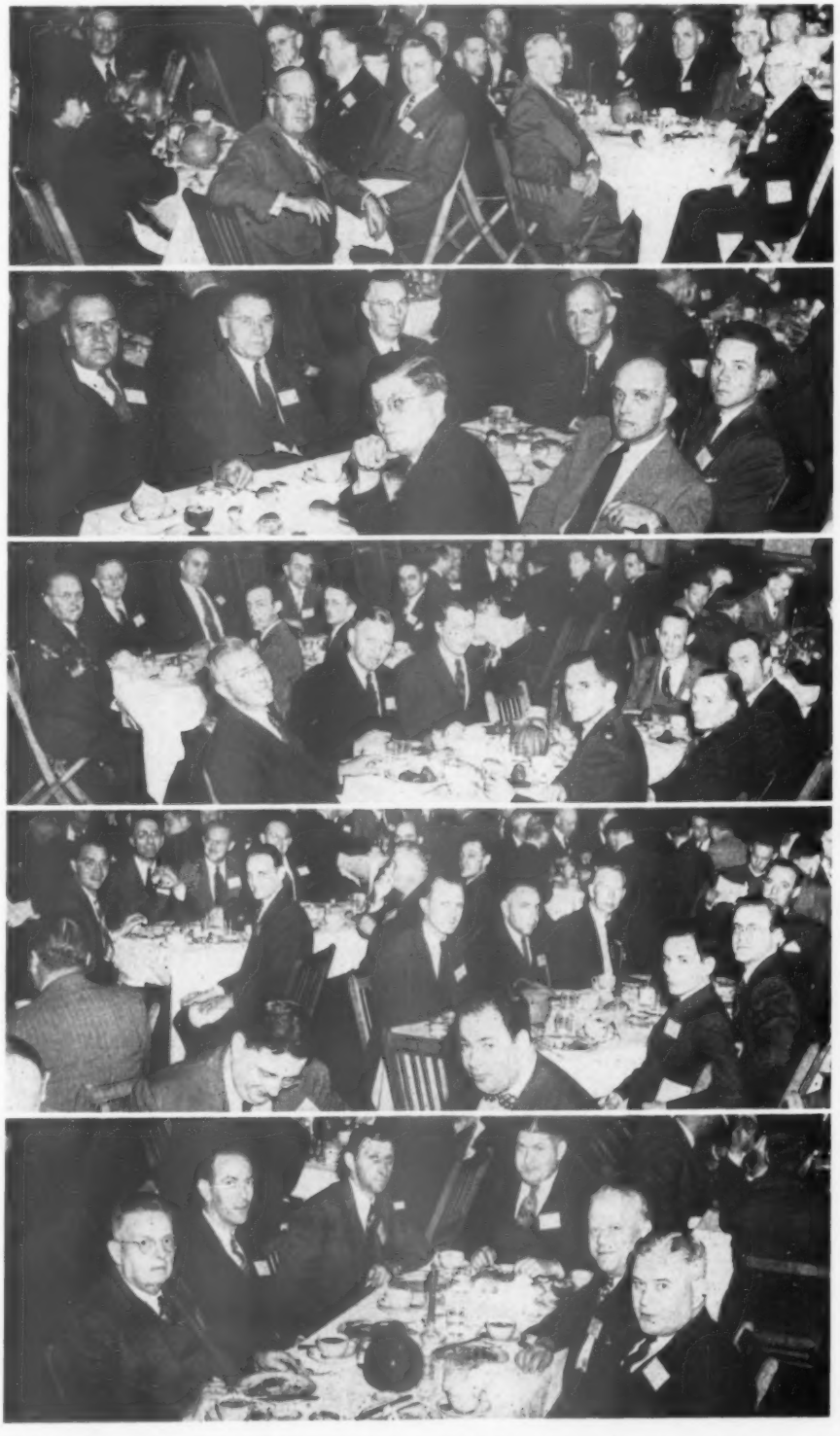
A thorough review of the work and facilities of all departments should be made before undertaking any expansion of equipment, he warned. Often only relatively modest expenditures may be found necessary; and when important expansion is desirable, care should be taken to provide for flexibility of layout he said.

He warned against the use of working capital for providing new facilities. Such financing in general is unsound and is discouraged by banks. Also he said that a foundryman in modernizing equipment should make sure that the cost will be liquidated within a reasonable time. New equipment should pay for itself within at least three years, if not sooner. He thought two and one-half years should be ample in most cases.—*Ben K. Price.*

Central Illinois

CASTING Dimensional Control," was the subject of a talk given by A. F. Pfeiffer, foundry and pattern division, Allis-Chalmers Mfg. Co., Milwaukee, before the Central Illinois Chapter of the AFA at its monthly meeting held at the Jefferson Hotel, Peoria, Ill., Nov. 4.

Mr. Pfeiffer pointed out the impera-



Additional views of luncheon group at Philadelphia regional conference

tive need of more apprentice training programs as the supply of patternmakers is diminishing while the demand is increasing. He also stressed the necessity of good co-operation between the engineer, patternmaker and foundry, all working for one common cause—a good saleable product that meets the purchaser's demand.—*George H. Rockwell, secretary-treasurer.*

Twin City

THOSE WHO braved the rainy night of Oct. 10 to attend the joint meeting of Twin City Chapter of the AFA and American Society for Metals heard an interesting speech, "Humanics in Industry," by Ralph L. Lee, General Motors Corp., Detroit.

Mr. Lee opened his talk by stressing the importance in industry of precision measuring tools, all of which we have except a "humanometer" for measuring human characteristics. Although there is no such instrument, there are some guiding principles which help men to understand human behavior.

He set forth four pertinent facts related to human behavior—everyone is different and the only one of his kind; most people are what they are because they can't change or be changed much; no one individual is the same all the time and everyone is proud of being different.

Comparing people with metals and metal alloys, Mr. Lee said that they can only change or be changed within the limitations of their basic characteristics. People, like metals, are not the same all the time. What is their present state of health, state of mind, state of nerves, home troubles, social problems, etc.? It is necessary to know people and keep up to date on facts regarding them if employee-employer relations are to be smooth.

Mr. Lee concluded by saying that the phrase, "employee relations" is only another way of saying how employees feel toward management in relation to the way management feels toward employees. It must be a two way proposition or it can not be a good relationship.—*J. W. Costello.*

Saginaw Valley

EARL E. Woodliff, Foundry Sand Service Engineering Co., Detroit, spoke on "Molding and Core Sand Binders" at the Nov. 7 meeting of the Saginaw Valley Chapter of the AFA at Frankenmuth, Mich. More than 150 members and guests attended.

Mr. Woodliff classified binders into two general groups: Combustible and noncombustible. By means of charts and graphs, he explained thoroughly the action of all the common binders in holding the grains of sand together, and indicated the temperature ranges through which each of the binders was effective.

His talk was especially well presented and from the post-meeting comment of the group, he is certainly to be highly recommended to other chapters.—*Joseph J. Clark, reporter.*

Northeastern Ohio

FOUR sessions—gray iron, malleable iron, nonferrous and patternmaking—were carried on simultaneously at a meeting of the Northeastern Ohio Chapter of the AFA, Nov. 14 at the Cleveland Club.

At the gray iron sessions, presided over by James G. Goldie, M.B.M. Foundry Co. Inc., and Charles U. Geesey, Superior Foundry Co., Inc., the first subject for discussion was the use of beehive coke as a cupola fuel. General opinion as expressed by several speakers was that beehive coke is inferior to by-product coke in several respects but in the present emergency shortage several foundrymen are mixing it with by-product coke to the extent of 10 to 20 per cent. One objection is that the high sulphur content, in some instances 1.25 per cent, renders it unsuitable for melting high test iron. A second objection is its friability or tendency to collapse and pack under normal charges. A member pointed out that the latter objection could be overcome by reducing the

(*Continued on page* 168)

SOUTHERN CALIFORNIA: Group at the November meeting of Southern California Chapter of the AFA in Los Angeles. Front row, left to right, are: B. G. Emmett, chapter past president; Professor Cady, University of Southern California, and Gordon Sondraker. Back row, left to right, are: Earle D. Shomaker, chapter treasurer; William Emmett, chapter chairman; Lester C. Young, speaker for the meeting; Henry E. Russill, chapter vice president and L. O. Hofstetter, chapter secretary

When You Install DUSTUBE Filter Tubes

You Need Only

ONE MAN + THESE TOOLS

Inserting "Dustube" bag into cell plate on a "Dustube" Dust Collector.

1ST DO THIS

2ND DO THIS

and the JOB IS DONE

Operator hanging a "Dustube" bag on an overhead hook attached to the shaker channel.

Yes . . . that's all there is to it. It's a quick and easy job to install filter tubes in a Dustube Dust Collector. No tools are necessary, just a pair of hands. One man can do the job quickly, and he always works on the clean air side . . . never on the dirty air side. Tubes can be inspected from a central walkway without removing them. Features like these keep maintenance costs way down. Since the tubes are compact and light, they are easy to store, easy to handle, economical to ship, and do not burden the collector with excess weight.

Simplicity of design and ease of operation are just two of the many important features of the Dustube. Why not get complete facts about it? A request will bring you our latest literature by return mail . . . and without obligation. Ask for Catalog 72.

WRITE FOR CATALOG 72

A 54 page illustrated book showing the full line of Dustube dust collecting equipment. Contains valuable data on ventilation.

American

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LOOK AT EYE SAFETY FROM THE WORKER'S ANGLE

WILLSON RUBBER MASK GOGGLE
X40 Series—especially designed for chemical process industries.

ADD COMFORT TO PROTECTION

TO MAKE YOUR EYE SAFETY PROGRAM WORK

Your by-word may be "Safety First"—and it should be. But to most workers, comfort—or the lack of it—determines whether they wear the goggles or carry them around in their pockets.

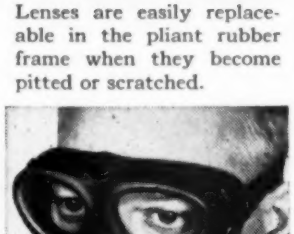
Here is a rubber mask goggle that overcomes the usual objections. Its resilient rolled edge acts as a shock absorber and combines wearing comfort with protection against impact. The rolled edge fits all facial contours to assure snug fit, without pressure, excluding dust, flying particles and splashing liquids.

Maximum eye protection is afforded by Super-Tough* heat treated lenses whose large triangular shape permits wide vision. And the goggle may be worn over prescription glasses in comfort.

For help on your eye protection problems, consult your Willson Distributor or write direct.

* U. S. REG. U. S. PAT. OFF.

Lenses are easily replaceable in the pliant rubber frame when they become pitted or scratched.



Ventilated goggle illustrated. Also available in non-ventilated type for maximum protection against dust and splashing chemicals and acids.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON PRODUCTS INCORPORATED

Established 1870

237 WASHINGTON STREET, READING, PA.

(*Continued from page* 166)

weight of the iron charge from that usually employed with by-product coke.

On the subject of cupola lining it was stated that amorphous silica is more satisfactory than any other material. Mixed approximately half and half with fire clay it is allowed to soak over night and then prepared in suitable size blocks or slabs packed against the cupola wall with pneumatic rammer. The material also is used as a ladle lining. It was claimed the material is particularly well adapted for use in cupolas running long heats with high steel content. Additional subjects for discussion included sand grain size and permeability, and comparison of front and back slagging.

The malleable iron group, under the co-chairmanship of Fred Pfarr, foundry superintendent, Lake City Malleable Co., and Elmer Zirzow, coreroom foreman, National Malleable & Steel Castings Co., discussed casting defects. A number of castings having typical defects were passed around the audience for opinions as to the causes of the defects and steps to be taken to prevent their occurrence. The castings added considerable interest in the discussion and assisted in classifying the different types of defects commonly encountered.

Louis Schmidt, Aluminum Company of America, addressed the patternmakers on "Elements to be Considered In Estimating Pattern Costs." He stated that in too many cases, cost estimates for making patterns are based on opinion and not facts. For estimating patternmaking costs intelligently, six important points must be considered, according to Mr. Schmidt:

1. Understand the requirements of the foundryman—number of molds (and castings) to be made from the pattern, alloy to be used, tolerances required, etc.

2. Understand all details of the blueprints.

3. Know the method of casting or molding to be used. Consider the different methods of gating that might be used and the placing of coreprints. Maintain the foundryman's point of view. Remember, he has to work with the pattern.

4. Analyze the method of pattern construction. Cost of a pattern distributed over the entire production of castings from that pattern is slight. Convince the foundryman that it pays him to buy the best pattern.

5. Consider manpower. Do you know your employee? Get his confidence and co-operation and give him yours.

6. Calculate overhead costs. Don't attempt to reduce overhead at the expense of the worker in your plant by reducing lighting, facilities, etc.

Mr. Schmidt concluded by saying that

(*Continued on page* 170)

CLEANSES IRON--

Castings are Sounder, Cleaner!

Famous CORNELL CUPOLA FLUX

TIME-PROVEN! *Leading foundries have used it regularly--for years*

Its purging action causes rapid elimination of slag and other impurities from molten metal.

It makes iron hotter and more fluid.

It enables you to pour castings that are denser grained, stronger, cleaner—no chilled sides or hollow centers.

It makes machining definitely easier.

It forms a glazed or vitrified coating over brick in melting zone. This not only adds to life of brick but insures clean cupolas—clean drops—and cuts maintenance cost amazingly.

Write for Bulletin 46-B

• EXCLUSIVE SCORED BRICK FORM

Takes but a few seconds to use and promotes accurate measurement—correct quantity of flux per charge. You simply toss in a brick for each ton or break off a briquette (quarter section) for each 500 pound charge of iron. It does not blow out with the blast but stays in melting zone until entirely consumed.

The CLEVELAND FLUX *Company*

1026-1036 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Brass and Aluminum Fluxes Since 1918

FAMOUS CORNELL FLUXES Trade Mark Registered

Write for Bulletins

Famous CORNELL ALUMINUM FLUX

Produces clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections are poured. Castings take a higher polish. NO FUMES! Exclusive formula prevents obnoxious gases. Metal does not cling to dross.

Famous CORNELL BRASS FLUX

Makes metal pure and clean, even when dirtiest brass turnings or sweepings are used. Produces castings which withstand high pressure tests and take a beautiful finish. Saves considerable tin and other expensive metals. Crucible and furnace linings are preserved.

Famous CORNELL LADLE FLUX

Place a few ounces in bottom of ladle, then tap cupola. Metal is thoroughly cleansed, foreign impurities are easily skimmed off. Ladles are kept clean, there is less patching and increased ladle life. Metal temperatures are retained during transfer to molds.

TYPE CS, illustrated above, is priced at $270.00 complete, and is one of several available types.

Ask Your Supplier to Quote on a Combs Great Western Riddle

We are far from satisfied with the delivery dates which we are constrained to quote on Combs Gyratory Riddles . . . however, we DO suggest that you check with your foundry supply house or with us direct for a quotation . . . we're really not doing too badly. A good riddle *will* save a lot of man-hours and Combs Riddles have always been a real, labor-saving investment in the foundry.

MADE ESPECIALLY FOR FOUNDRY USE BY

GREAT WESTERN MANUFACTURING CO.

LEAVENWORTH, KANSAS

★

COMBS GYRATORY FOUNDRY RIDDLES

(*Continued from page* 168)

for a patternmaker to get repeat business he should avoid short cuts but render full and complete service at all times.

The nonferrous group, with A. H. Hinton, Aluminum Co. of America, and Frank Nemcik, Apex Electrical Mfg. Co., as co-chairmen, had a lively discussion on ways and means of uniformly producing aluminum castings which will meet the exacting demands set up by consumers. It was pointed out that an extremely smooth surface was expected in addition to the casting being sound—a combination that requires close attention to every detail. Mention was made of the need for close supervision in all operations to insure that they are being performed properly. Sands must be selected to give desired smoothness of surface without interfering with venting of steam and other gases generated during pouring. Both naturally bonded and synthetically bonded sands are being used successfully.

Southern California

SOUTHERN California foundrymen don't need to be "sold" on machine molding. But they do have to be sold the machines, many of which have been on order for months by leading foundries in the area.

This was brought out at the November meeting of Southern California Chapter of the AFA during an address on machine molding by Lester C. Young, vice president and chief engineer, SPO Inc., Cleveland, and in the question period which followed.

Mr. Young stressed the fact that patterns must be built for machine use and that the know-how of this technique is highly important. He generalized the efficiency of machine methods with the remark that on a comparative basis 900 molds a day are made with two machines as against 300 a day with hand-mold methods.

His statement that the floor molder, truly an artist in his line, is dying out, precipitated a lively discussion on the question of what will be done when they all are dead? This in turn brought on a brief summarization of the need for apprentice training systems, not only in Southern California, but over the nation.

Questions from the audience disclosed that only about 50 per cent of southern California shops are machine equipped. Many of the smaller shops cannot now afford capital outlays necessary for such equipment. The larger shops cannot get delivery on machines ordered long ago.

Officer R. T. Gilmore, traffic education department of the Los Angeles Police Department, gave an interesting talk on

(*Continued on page* 172)

Bay State, with a new streamlined system of processing orders, 80% more manufacturing space, additional equipment, and new modern facilities for stock, now offers you improved delivery. We have added to our personnel, and appointed several new distributors strategically located to serve you, while our regular distributors have greatly increased their stock of wheels.

Large enough now to meet quickly all your abrasive needs, we are still small enough to give your orders individual attention.

These improved facilities and our usual high quality product warrant a trial.

Branch Offices and Warehouses — Chicago — Detroit. Distributors — All principal cities.

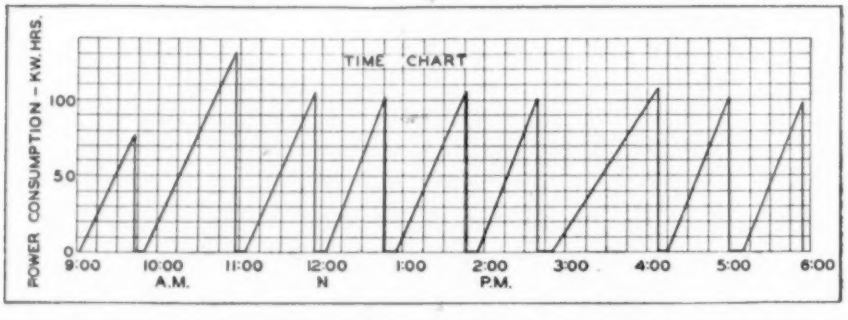
BAY STATE

Top Performance Consistently Duplicated

BAY STATE ABRASIVE PRODUCTS CO. • WESTBORO, MASSACHUSETTS, U.S.A.

DAILY OPERATING RECORD OF SMALL DETROIT ELECTRIC FURNACE MELTING GREY IRON

DAILY GRAPHIC OPERATING RECORD, TYPE LFC, 350 LB. DETROIT ROCKING ELECTRIC FURNACE, MELTING HIGH QUALITY GREY IRON FOR CYLINDER LINERS.



SUMMARY: HOURS OPERATION 9; NO. HEATS, 8; WT. PER HEAT, 375 LBS.; TOTAL METAL MELTED, 3000 LBS.; KWH TOTAL, 931; KWH PER TON, 620.

Let's take a look at the facts from the daily operating record of a Detroit Rocking Electric Furnace covering a 9-hour working day.

Making high quality grey iron for cylinder liners, from borings, scrap and ferro-alloys, a Type LFC, 350 lb. Detroit Rocking Electric Furnace poured 8 heats in the 9-hour period, each heat weighing 375 lbs., for an output of 3000 lbs. Melting time per heat was 49 minutes; elapsed time per heat, (after the first heat which included preheat period), was 56 minutes. Because the design of Detroit Furnaces permits close control over time, temperature, composition, and other vital melting factors, an engineering product of superior wear resistance is produced. And cost? Consider the low priced raw materials used—consider the quality of the product—and only 620 Kw. hrs. per ton!

Records like this are incontrovertible evidence that Detroit Electric Furnaces are fast melting, economical, efficient. They are your assurance that Detroit Electric Furnaces, installed in your own foundry, will do a faster, more versatile job of melting ferrous and non-ferrous metals. Write for further facts.

DETROIT ELECTRIC FURNACE DIVISION
KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

(*Continued from page* 170)

the hazards of traffic and their cures as a preliminary to Mr. Young's address.—*Maurice Beam.*

St. Louis

FIRST exclusively nonferrous meeting in many years was held by the St. Louis District Chapter of the AFA at the DeSoto Hotel, St. Louis, Nov. 14. The fine turnout of approximately 100 members and guests indicated an increased interest in nonferrous foundry practice.

William B. George, foundry engineer, R. Lavin & Sons Inc., spoke on "Brass Foundry Practice," and during the course of his talk brought out some interesting points on the net shrinkage in brass castings. A number of brass foundrymen present carried on a lively discussion on crucibles, combustion and oxidation at the close of the talk.

During the evening a moment of silent tribute was paid the late M. A. Bell, an old friend and officer of the chapter.

Preceding the regular program, L. Knippenberg presented an interesting and different slant on industrial relations in a coffee talk entitled, "Other Man's Viewpoint."— *John W. Kelin, publicity chairman.*

Western New York

APPROXIMATELY 100 members and guests of Western New York Chapter of the AFA heard Harry W. Dietert, Harry W. Dietert Co., Detroit, discuss "Metal Penetration and Burnt-on Sand," at the regular monthly meeting at Hotel Touraine, Buffalo, Nov. 1.

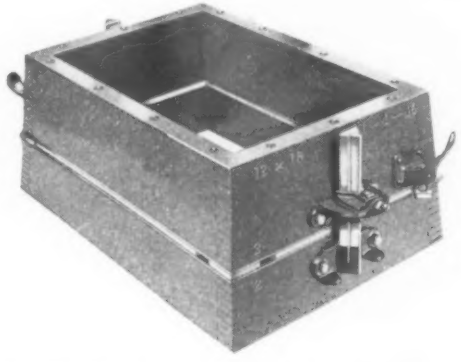
Alfred A. Diebold, chapter technical chairman, introduced Mr. Dietert who, in his talk, explained that the conditions responsible for metal penetration may be divided into four groups; Thermal, physical, chemical and characteristics of the metal. He pointed out that the penetration defects originating from a too porous mold surface due to coarseness of the sand, low flowability or soft ramming are corrected by reducing the green strength, grain size or stiffness of the sand mixture. All of these factors will increase flowability of the sand mixture and give a continuous, uniform mold surface under normal ramming. In some cases, increasing or improving the ramming will eliminate penetration.

Veining may be caused by the early collapse of a core, but, according to Mr. Dietert, there are many penetration defects and some veining defects that are caused by an oxidizing atmosphere. These are the most difficult to eliminate and the remedy lies in the application of mold atmosphere control.

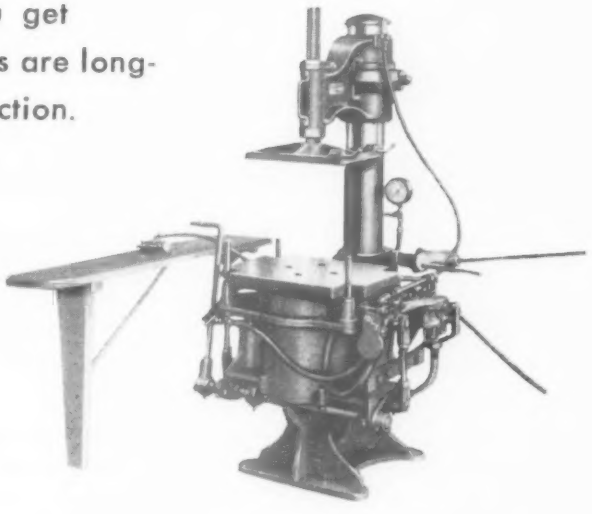
(*Continued on page* 174)

MACHINES with a KEEN SENSE of ACCOUNTING

In Arcade foundry equipment you get sturdy, simple machines whose objectives are long-lived usefulness and low cost production.



Slip Flask—highest grade Tennessee Cherry. V-shaped pins and guides accurately milled for squeezer work. Also available—¾″ round pins for machine flask. Steel jackets to match. 5° taper.



No. 72-28 Jolt Squeezer Stripper with hand lift—a husky machine with an accurate lift. Lifting mechanism has bronze bushings throughout. Portable or stationary models.

ARCADE MANUFACTURING DIVISION

ROCKWELL MANUFACTURING COMPANY
FREEPORT, ILLINOIS

(*Continued from page* 172)

He covered the dilatometer penetration test method used to evaluate protective atmospheres formed by various facing materials and illustrated such tests with slides and motion pictures. A lively question and answer period followed the talk.—*Leo A. Merryman, secretary.*

Mexico City

IN CELEBRATION of its first anniversary Mexico City Chapter of the AFA held a special one-day meeting, Nov. 7. In accordance with the official program, all members were registered at 9:30 a.m. at the chapter's meeting rooms at Barcelona 11, Mexico City. Reservation and transportation facilities were extended for the benefit of all, but especially for out-of-town visitors.

At 11 a.m. a visit to La Consolidada S.A. was arranged. This concern operates one of the largest steel foundries in Mexico. Several groups were formed and each was conducted through the plant by competent guides. La Consolidada served luncheon in its dining room as a courtesy to the visitors.

During the evening session, held at 7 p.m., several speakers spoke on topics of interest, followed by a general discussion of different motions presented at the session. Friends and guests present at the meeting were welcomed.

The first anniversary banquet was held at the Chapultepec Restaurant at 9 p.m. Good food and music were enjoyed by all until past midnight.

Among those present were Ernesto Villalobos, John Schendel, N. S. Covacevich, Fernando Gonzalez V., Manuel Goicoechea, Secundino Ruiz, Longinos Canas, Jose Galvan, Luis Castillo, Julio Natalio Sauchez, Ward Dougherty, Alberto Phillips Skinfield, Ricardo Castro, Pedro Quintanilla Duclaud, Carlos Quintanilla Rivero, Enrique Torres T., Carlos Molina A., Carlos Molina P., Enrique Molina P., Luis Suarez, Guillermo Aguayo, Miguel Alvarez, M. Sanchez, Juan B. Vazquez, Guadalupe Tejeda, John DeClerk, Macias Sauza, Roland Bastida, Carl E. O'Brien, Diego Costelo, Francisco Acosta, N. Covacevich, Manuel Lacarra, G. J. Porchini, Luis Fernandez, Ing. Tavera M. Cruz, Roberto Meneses, Ernesto Gonzalez Tavera, and many others.—*N. S. Covacevich, secretary.*

MEXICO CITY: Above—General view of members of the Mexico City Chapter of the AFA at their first anniversary banquet, Chapultepec Restaurant, Nov. 7. Below—A group at the first anniversary luncheon at La Consolidada S. A. Left to right, facing camera, are: Secundino Ruiz, chapter vice president; John W. Schendel, chapter vice president; N. S. Covacevich, chapter secretary; Ward Dougherty, Osborn Mfg. Co., Cleveland, and F. Gonzalez Mena, chapter vice president

Northern California

NOVEMBER meeting of the Northern California Chapter of the AFA was held at the Engineers Club, San Francisco, Nov. 1. Speaker for the evening was Lester C. Young, chief engineer and vice president, SPO Inc., Cleveland. Mr. Young described applications of machine molding that are now common in the East and explained some of the advancements made in molding machine design.

He stated that a week's stay in the Bay area had convinced him that the local foundries had the work, pattern equipment, the know-how and many of the machines to obtain production equal to eastern plants. The only factor preventing the attainment of this production is better co-ordination of all phases of modern foundry operations.

Guests attending the meeting included L. F. Diebell and Erik Boeregois, Stanford University; Russell Goldsmith, Gamlen Chemical Co.; Al Carter, Vulcan Steel Foundry and Carl Straub and Larry Williamson, Columbia Steel Co. New members reported by Harris Donaldson, membership chairman, included Ralph Peters, Electro-Metallurgical Sales Co.; E. C. Friday, National Carbon Co.; Robert H. Wapole, American Air Filters Co.; Roy Thut, Thut Foundry, and A. B. Castagnola, Ernie Ritelli and John Russo, General Foundry Services Inc.

President Richard Vosbrink reported that the open house held by the Mare Island Navy Yard for Navy Day was a success and expressed the thanks of the chapter for the invitations extended by Joseph Bentley, master molder, and George Dalby, metallurgist, Mare Island Yard.

Bill Clark, chairman, melting control committee, reported on the first meeting held at Macaulay Foundry, Oct. 25, and other activities of his committee and suggested that the nonferrous group form a committee to study their melting problems.

In the absence of Chairman Milton Nystrom, John Russo reported on the plans and progress of the committee preparing for AFA participation in the Western Metals Congress to be held in Oakland in March.

A raffle was held at the meeting to raise funds to enable the chapter to sponsor an exhibit at the forthcoming Scout-O-Rama to be held at Oakland

(*Continued on page* 176)

Life Insurance for your foundry

foundry modernization

THE insurance policy has not been written that will protect your foundry against the march of time. The ever-changing problems of progress can be solved only by an intimate, intelligent study of your organization, your procedures and methods, and your facilities. This process—the study and control of each function of your business—reaches far deeper than mere mechanization. It can only be termed *foundry modernization.*

The complex and diverse problems arising from foundry modernization present, by their very nature, a "nut" that few, if any, foundry organizations can "crack" by themselves. Qualified, experienced assistance from the outside is needed. Recognizing this fact, Lester B. Knight and Associates, Inc., has developed a staff of 30 engineers, including men with 15 to 22 years experience in foundry production, management, engineering, and equipment...in every type of foundry. Based on the sound philosophy that *the results of any job are no better than the men who do it,* the Knight organization offers not one, but many men with specialized experience for each phase of your particular modernization program. Combined, they represent insurance which, we sincerely believe, will result in an adequate return to labor, management, and owners.

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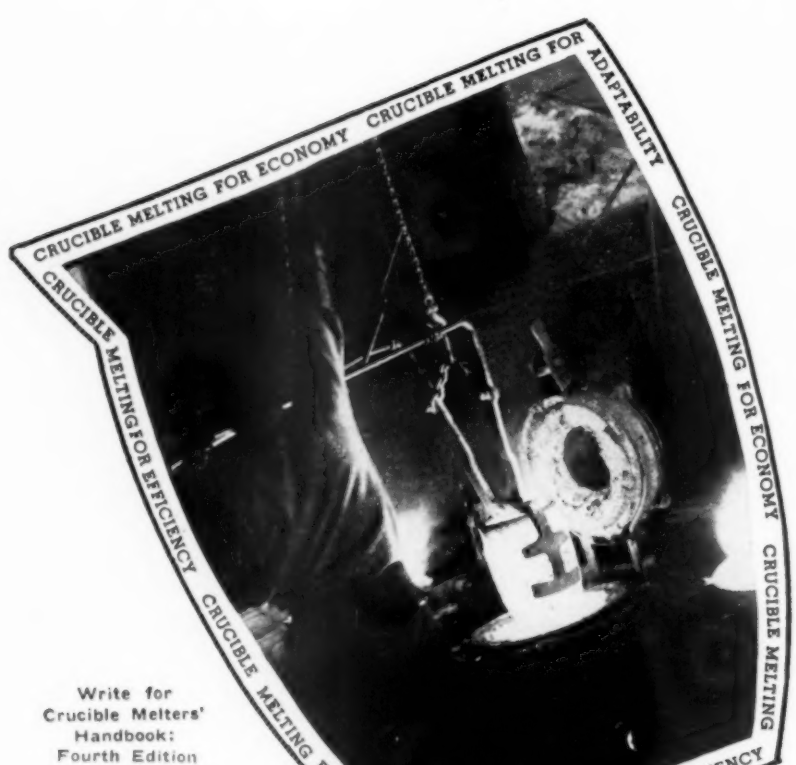

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CRUCIBLE MELTING FOR FLEXIBILITY CRUCIBLE MELTING FOR ADAPTABILITY

CRUCIBLE MELTING FOR EFFICIENCY

CRUCIBLE MELTING FOR ECONOMY

Crucible Melting Wins

Whatever qualities you want in your nonferrous melting, you will most likely find them combined in crucible equipment.

Advancing through the years crucible melting has proved its worth, and still today it stands first in practically every desirable melting quality. Results reported from hundreds of foundries prove these claims.

You will win in all around satisfaction with crucible melting.

CRUCIBLE MANUFACTURERS ASSOCIATION

90 WEST STREET, NEW YORK 6, NEW YORK

MELTING FOR ADAPTABILITY FOR FLEXIBILITY

(*Continued from page* 174)

Auditorium, Feb. 20, 21 and 22. The exhibit will demonstrate the Scouting Merit Badge for foundry practice. A molding machine will be furnished for the exhibit by General Foundry Services, molding sand by Brumley-Donaldson Co., crucibles by Joseph Dixon Co., core oil by Gamlen Chemical Co. and flasks by Hines Flask Co. and Chamberlain Co.

Over 80 members and guests of the Northern California Chapter attended the annual golf party at Mira Vista Country Club in the Berkeley hills, Oct. 11. Twenty members participated in the golf tournament and many went home with prizes. Horseshoe pitching honors were won by Stewart Tone, American Brass & Iron Foundry, and Ralph Noah, San Francisco Iron Foundry. Charles Nyland, Mare Island Navy Yard, won the door prize—a set of book ends which had been donated by Fred Mainzer.

Guests of honor at the party were Shelly V. Wood, AFA national president, and W. W. Maloney, national executive secretary. It was the first time since its inception that the chapter had been so honored:—*Charles R. Marshall, publicity chairman.*

Central New York

APPROXIMATELY 110 members and guests heard J. A. Gitzen, president, Delta Oil Products Co., Milwaukee, and chairman of the American Foundrymen's Association core binder and wash committee, address the Central New York Chapter of the AFA at Onondaga Hotel, Syracuse, Nov. 15.

Mr. Gitzen started his talk, "Properties of Binders Used in the Foundry," with a description of the various organic and inorganic materials used as binders in cores and molds and the effects and results of these materials used alone and in combination.

He outlined the effects of the use of excessive moisture for green strength, saying that in many instances the core is finally baked when the molten metal is poured into the mold cavity. During baking the core temperature remains at 212 F as long as moisture is present, even if the oven temperature is 425 F. The binders do not dry out thoroughly at this temperature and the core is still "green" though the surface is apparently hard and dry.

According to Mr. Gitzen, this condition in cores may result in dirty and porous castings because of the tremendous amount of gas generated by the green cores.

(*Concluded on page* 178)

Cast Iron

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FREMONT MAGNESIUM FLASKS

ACCURATE.

STURDY...

LIGHT.....

BUILT FOR LONG SERVICE AND FAST PRODUCTION

GROOVLOCK

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It's "KNOWING HOW"
That makes the difference

● Note the special features in this Goergen-Mackwirth Brick Drying Oven:

... Doors Strongly Reinforced Internally—Prevents sagging or warping with use. Extra long hinges are sufficiently strong to carry the weight.

... Unit Panels—Permit oven to be easily taken down, moved, stored or re-erected elsewhere. Each panel is complete in itself.

... All Parts Readily Accessible from either the top or inside of oven.

... Standing Seams—for maximum structural side-wall strength.

Goergen-Mackwirth are specialists in the movement and control of air. Leading industries call on their engineering knowledge and experience when installing Ventilating Systems, Exhaust Systems, Dryers, Paint Spray Booths, Air Conditioning Systems and similar equipment. Send us YOUR problem and we'll work out the best way to solve it.

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(*Concluded from page* 176)

He noted the increasing use of plastic type binders, especially in magnesium foundries and stated they had many possibilities and would probably be used more extensively in the future.

Dr. Andre Salmont, director of industrial hygiene for foundries and mines of the French government attended the meeting. He is making a special survey for his government in the United States and Canada. Several members of the Buffalo Chapter of the AFA also were present.—*J. A. Feola, publicity chairman.*

Cincinnati

APPROXIMATELY 90 members of the Cincinnati District Chapter of the AFA heard F. J. Wurscher, consulting metallurgist, Semet Solvay Co., talk on "Foundry Practice" in a meeting at the Engineering Society Headquarters, Nov. 11.

Mr. Wurscher's talk was centered primarily on the points of cupola operation that are usually neglected by the average operator and which contribute to poor control. The meeting was interesting and lively with plenty of questions and discussion.—*E. F. Kindinger, secretary.*

Texas

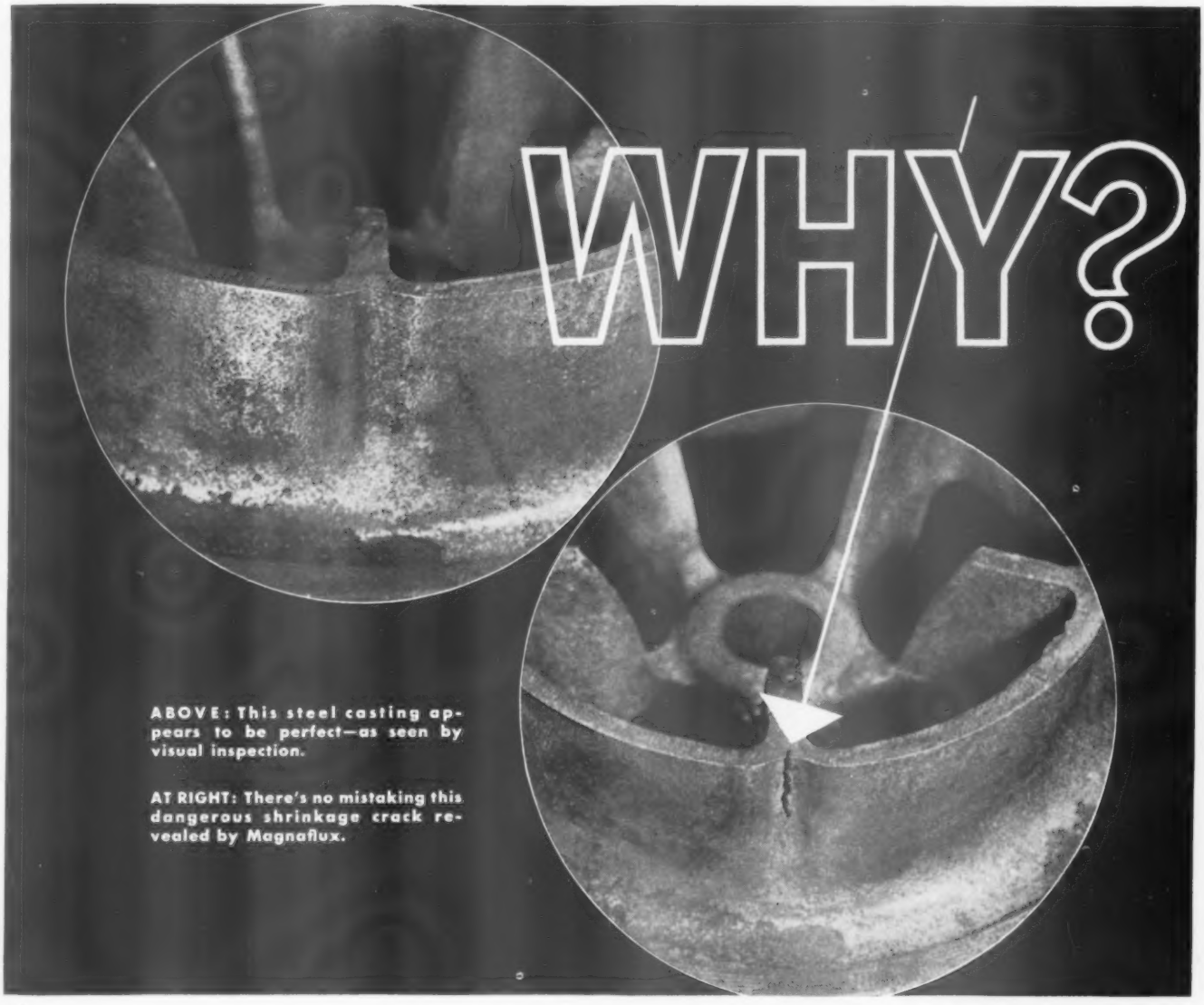
THE MEETING of the Texas Chapter of the AFA held at the Rice Hotel, Houston, Tex., Oct. 25, featured a coffee talk by former Commander Iliff D. Richardson and a paper by John Sandberg, metallurgist, Emsco Derrick & Equipment Co., Los Angeles.

Commander Richardson is co-author of the best seller, *An American Guerrilla in the Philippines*. He related many of his experiences while behind Jap lines, touching lightly on the horror and emphasizing the humorous incidents.

Mr. Sandberg spoke on "Better Castings for the Oil Industry," emphasizing the need for better liaison between the foundry and the customer. He cited examples of designs and specifications which foundries accept, knowing that these designs or specifications will prevent them from making good castings. —*W. H. Lyons* III.

Meter Company Buys Eastern Foundry

Parkway Foundry & Machine Corp., Brooklyn, N. Y., has become a subsidiary of the Neptune Meter Co., Long Island City, N. Y., and will be operated by the present management with the added assistance and facilities of the parent company.



ABOVE: This steel casting appears to be perfect—as seen by visual inspection.

AT RIGHT: There's no mistaking this dangerous shrinkage crack revealed by Magnaflux.

DETECTION Through **MAGNAFLUX*** Inspection Leads to **CORRECTION** of the Causes of Defects

Modern quality control in the foundry does not stop at culling out defective castings. It looks into every instance—seeks to trace and eliminate the causes for sub-standard production. More and more foundries use Magnaflux because it can detect *hidden flaws* continuously—non-destructively.

In addition to shrinkage cracks, Magnaflux reveals blow holes, porosity, cold shuts and many other surface and sub-surface discontinuities. Quickly and economically, the size, shape and location of such flaws are shown up in minute metallic particles. *With Magnaflux it's easy to analyze and correct the conditions that cause defects.*

It will pay you to investigate the possibilities of Magnaflux in building up effective quality control. Foundry inspection protects customer good will . . . *Write today for full details.*

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Industry BRIEFS

NATIONAL Malleable & Steel Castings Co., 546 North Holmes Ave., Indianapolis, has started a $2,000,000 mechanization and modernization project and expects to increase production by 50 per cent. A new foundry building, covering 40,000 sq ft, has been completed and will house two new melting furnaces. A new stock bay, 7½-ton overhead crane, new skip hoist, improved conveying equipment and 16 gas-fired annealing ovens are included in the improvements.

Farrel-Birmingham Co. Inc., of Ansonia, Conn. and Buffalo, has reopened its branch office at 120 South La Salle St., Chicago. The office is in charge of Harry Temporal, who has been with the company for 26 years. He formerly was Chicago office manager, was in charge of company branch offices at Cleveland and Akron, and has served in the sales departments at Ansonia and Buffalo.

• • •

William E. Armstrong, president, Armstrong Foundry & Mfg. Co., 2224 South Jefferson Ave., St. Louis, has purchased a foundry building on a 5-acre tract east of the Missouri Pacific right of way. Fred J. Luchlie, trustee in bankruptcy for the Mississippi Valley Iron Co., conveyed the property.

• • •

Chris Erhart Foundry & Machine Co., 1237 West Sixth St., Cincinnati, has contracted to buy the site adjoining its plant from the Cincinnati Union Terminal Co., and when building conditions become normal will construct a modern plant on the site.

• • •

Knight & Sons Foundry, 1430 Ash St., Terre Haute, Ind., has been completed and is producing gray iron job castings. Lon A. Knight, general manager, formerly was associated with the American Brake Shoe Co.

• • •

Plant and equipment of Ferro Machine & Foundry Co., Cleveland, have been sold to a group of officers and members of the management group headed by John M. Price, company president. The new corporation will be known as Ferro Machine & Foundry Inc., effective Dec. 1. Crispin Oglebay is chairman of the board of the new corporation, other officers of which are the same as in the old corporation, as follows: President, John M. Price; vice president, Henry B. Myers; vice president and secretary, Ralph H. Weir; treasurer, N. E. Gauthier; assistant treasurer, Ernest M. Knapp. Specializing in automotive type castings, the foundry has a daily capacity of 500 tons of metal.

• • •

Shipments of ingot brass and bronze during October by 54 ingot brass and bronze manufacturers were 31,461 tons, according to the Defense Council of the Ingot Brass and Bronze Industry. This total is believed to represent over 95 per cent of the entire industry's deliveries and compares with 27,390 tons for September.

• • •

Dings Magnetic Separator Co. has moved into a new plant in Milwaukee, centralizing work previously carried on in two Milwaukee plants. New equipment and machine tools have been installed throughout, and in line with the latest color engineering practice, the shops and machine tools are painted in colors recommended to reduce eyestrain and to provide pleasant working surroundings.

• • •

Russell F. Lincoln & Co., manufacturer's representatives and foundry equipment consultants, 1058 Maplecliffe Ave., Lakewood 7, O., have been appointed by D. J. Murray Mfg. Co., Wausau, Wis., as representatives for the portable foundry core grinder which the latter manufactures.

• • •

H & H Foundry Supply Co., 509 Curtis Bldg., Detroit, has been organized by H. J. Robert and Jack Hirzel and Ralph V. Campbell to handle sales of miscellaneous foundry supplies in the Michigan territory. Mr. Campbell has been a foundry engineer for 20 years, more recently in sales activity.

• • •

Johnstone Foundries Inc., Grove City, Pa., recently organized by George Johnstone, has completed a contract with Meehanite Metal Corp., New Rochelle, N. Y., to manufacture Meehanite castings.

• • •

Sales of foundry equipment in October represented 469.2 per cent of the 1937-1939 monthly average, according to the Foundry Equipment Manufacturers Association. Sales in September were 424.4 per cent and were 457.8 per cent in October, 1945.

• • •

National Perma-Mold Corp., 1311 West Elm St., Independence, Mo., has been incorporated by National Aluminum & Brass Foundry Inc. of the same address and E. C. Austin Jr. and Lawrence H. Austin, with $10,000 authorized capital to manufacture, market and sell aluminum, brass, bronze and other metal castings.

• • •

Holland Aluminum Works, Holland, N. Y., has been incorporated with Henry Niemann, president, with capital stock of 250 shares at $100 per share. The plant has been enlarged and new equipment installed to increase its present production of aluminum castings.

• • •

A one-story, reinforced concrete-block shop and foundry building will be erected by Romeo Scoccia at 2619 East 56th St., Huntington Park, Calif. It will cover an area of 45 x 65 ft and will cost about $15,000.

• • •

Louis Petrigni and Joseph Seria have published a certificate that they are conducting business in the firm name of Imperial Cast Iron Foundry, 5404 Tweedy Blvd., South Gate, Calif.

• • •

Central State Foundry Co., 500 Aquamisi St., Cape Girardeau, Mo., has been incorporated by Robert W. Erlbacher and Raymond E. Hall with $50,000 authorized capital stock.

• • •

Potts Foundry Inc., Sheboygan, Wis., has been incorporated by Lucas J. Steimle, Francis C. and Anna Potts, with authorized capital stock of 400 shares at $100 par value per share.

• • •

The city of Oconto, Wis., has deeded to Stanley Toys Co. without cost a site for a foundry building to be constructed by the company to produce castings for its line of toys.

• • •

Acme Aluminum Alloys Inc., Dayton, O., producer of aluminum castings, tools, dies, patterns, jigs and fixtures, has opened a company branch office in the Commercial Trust Bldg., Philadelphia.

• • •

Gray iron castings production for October in the Philadelphia Federal Reserve district increased 15.2 per cent over September and 3.4 per cent over that of October, 1945, according to the University of Pennsylvania's Industrial Research department. Malleable iron production was 37.9 per cent higher than

in September and 57.1 per cent above October, 1945. Steel casting production was up 13.2 per cent from September but 9.4 per cent under last year. All stocks of raw materials were smaller than at the end of September. Unfilled orders for gray iron castings were lower and for steel castings higher than at the close of September.

• • •

Tooman-Harris Co., Racine, Wis., has been incorporated to deal in castings and related materials. Incorporators are A. R. and Eline J. Tooman and George V. Harris. One hundred shares of no par value stock have been authorized.

• • •

Fairwater Foundry Co., Fairwater, Wis., has been incorporated by Mildred Leskovitz, Dorothy Abramson and Julia Zimmerman. Capital stock of 500 shares at no par value has been authorized.

• • •

Kennametal Inc., Latrobe, Pa., has established an office at room 1605 Court Square Bldg., Baltimore, in charge of Harry W. Bearfoot.

• • •

Industrial Ovens Inc., formerly the Industrial Oven Engineering Co., has moved to its new plant and offices at 13825 Triskett Rd., Cleveland.

• • •

O. D. M. Foundry Co., 295 North Prairie Ave., Hawthorne, Calif., is being operated by Robert O'Neal, Donald Decker and James Maloney.

• • •

Frantz Pattern & Foundry Co., 2201 East Artesia St., Long Beach, Calif., will construct a 60 x 84-ft pattern and foundry building costing $15,500.

• • •

Superior Pattern Works, West Tenth St., Muncie, Ind., has been recently opened by William Hayes, owner.

• • •

Sullivanware Co., Hudson, Ind., has been formed recently to produce kitchen ware and die castings.

High Silicon Pig Iron Discussed in Book

Information on high silicon pig iron for foundries is given in the new book *Electro-Silvery*, offered by the Keokuk Electro-Metals Co., Keokuk, Iowa. The new book relates the special methods of processing and casting of high-silicon pig iron and describes the company's manufacturing process which permits a high degree of metallurgical control insuring the quality and uniformity of pigs and piglets. Many photographs, seven reproductions of oil paintings, and informative text present the story in an interesting manner.

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MODEL 84—
94″ wide, 42″ deep
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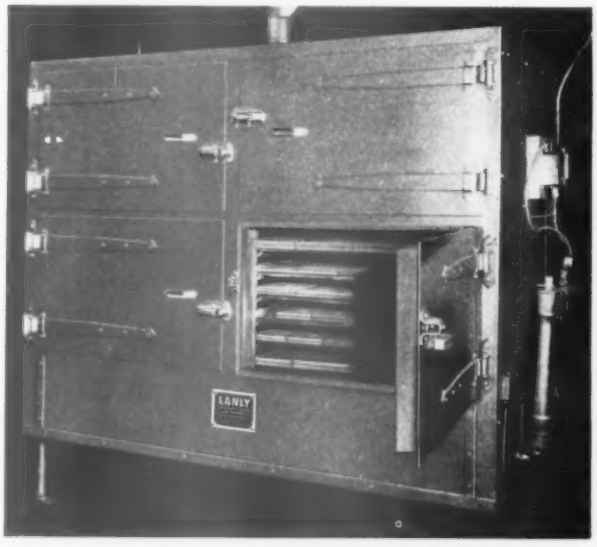

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Quantity production of these standardized shelf type ovens—performance proved in service—affords these advantages:

1. **Economical, satisfactory performance proved under varying conditions.**
2. **Lower prices than necessary for individually designed and specially built units of similar capacity.**
3. **Quicker delivery than required for specially developed units.**

These ovens are ruggedly built and completely self-contained. Thoroughly insulated and completely encased in metal. Economically fired by gas and uniformly maintained in temperature by the latest control devices. Well insulated doors are mounted on ext rugged hinges and equipped with explosion type latches. Liber in size and heat capacity.

SEND COUPON FOR DATA QUICKLY

Three standard sizes are available as shown above. Sign, tear out and mail for price and complete information covering the oven adapted to your needs.

THE LANLY CO.
OVENS FOR INDUSTRY
HEATED BY GAS, OIL, ELECTRICITY OR STEAM
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Send me additional information and price on a Model Number
..... Lanly Cabinet Oven.
Company .....
By..... Title.....
Address..... City.....

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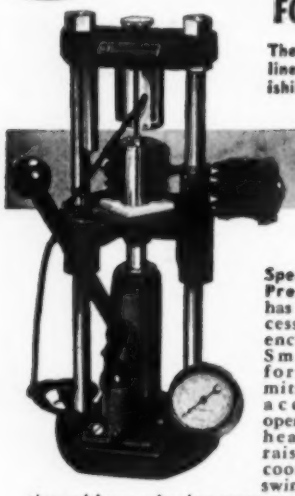
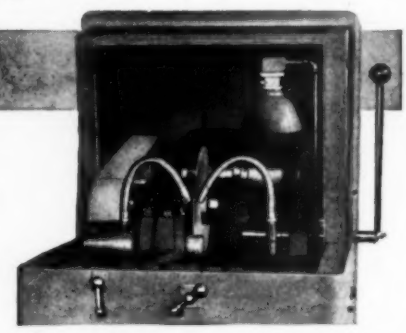
SPECIMEN PREPARATION EQUIPMENT AND SUPPLIES FOR THE METALLURGICAL LABORATORY

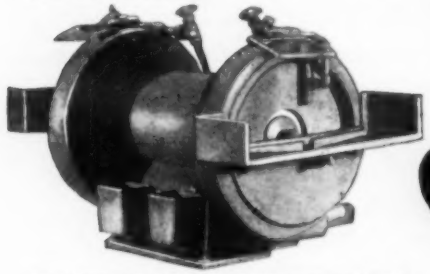
The items illustrated are selected from the complete Buehler line of equipment, tools and accessories for molding and finishing specimen mounts.



Specimen Mount Press No. 1315 has complete accessibility, no enclosed parts. Smooth performance permits speed and accuracy in operation. Solid heater can be raised and the cooling blocks swing into position without releasing pressure on the mold. This rapid cooling permits production of transoptic mounts in a few minutes. Shipping weight, 100 lbs.



Abrasive Cut-off Machine, Model No. 1000, is a solidly built, heavy duty piece of equipment free from sideplay or vibration with capacity for cutting specimen sections up to 3-1/2". Cutting is done on the front of the wheel and is controlled by a convenient outside lever. The driving motor is a totally enclosed ball bearing, 3 hp. with a separate motor driving the self-contained cooling system. Overall dimensions of cabinet 31" x 47" x 64". Shipping weight, 1400 lbs.



Wet Power Grinder No. 1210, powered with a 3/4 hp. totally enclosed ball bearing motor has two 12" water cooled wheels fitted with closed-in guards and non-shatterable shields. Suitable for coarse and medium grinding. Shipping weight, 310 lbs.

Hand Grinder No. 1410 is a most conveniently arranged two stage grinder. The grinding surfaces are 4-1/2" x 12-1/4" each with heavy 7/16" thick plate glass back. A reserve roll of 150 feet of emery paper is contained in drums for quick renewal of grinding surface. Base has gutter drains for surplus liquid in wet grinding operations. Shipping weight, 95 lbs.

Standard Polisher No. 1500. A complete unit with direct mounted ¼ hp. radial thrust ball bearing motor. The 8" polishing disc is attached to a tapered arbor on the motor shaft by means of a stout sleeve. This sturdy construction and unusually smooth vibrationless operation helps to prevent pitting and amorphous film in polishing. The removable splash ring forms a convenient hand rest that aids the operator in precision work. A handy control lever on the mounted switch gives selective speeds of 575 and 1150 r.p.m. Shipping weight, 100 lbs.

Low Speed Polisher No. 1505-2, is particularly adapted to final stage polishing and for non-ferrous metal samples. The 8" disc is attached to a countershaft by a tapered sleeve with a long span between bearings, a construction feature that assures smooth operation. The selective speeds of 150 and 250 r.p.m. make this polisher perfectly adapted to the wax lap or lead lap polishing technique. Shipping weight, 105 lbs.

Either the standard or low speed polishers can be furnished in a single unit table model polisher No. 1516. A three unit table model No. 1540 is also available for maximum convenience in three stage polishing.

In the complete line of Buehler accessories and supplies for the metallurgical laboratory are found: Abrasive paper sheets, discs, and rolls in every grade • polishing solutions • polishing cloths • cut-off wheels and molding powders. Buehler service includes everything needed for preparing precision specimens from metallurgical samples, available from one reliable source.

Buehler Ltd.
A PARTNERSHIP

METALLURGICAL APPARATUS
[illegible] West Wacker Drive, Chicago 1, Illinois

COLORIMETRIC TESTS FOR CHROMIUM IN FERROUS MATERIALS

(*Continued from page* 92)

Solutions may be made up in convenient volumes from pure chemicals and acids.

Standards	% Cr	% V	Degree of Permanency
Cast iron 107	0.455	0.015	30 min.
Cast iron 122a	0.032	0.015	30 min.
Cast iron 7d	0.020	0.038	30 min.
Cast iron Ironton	0.019	0.002	30 min.
Steel* 50a	0.52	0.970	30 min.
Steel 16c	0.045	0.003	30 min.
Steel 8g	0.009	0.002	30 min.

* 1/10-g sample.

Considering the 200 ml taken from the filtrate as water, the total normality of the sulphuric and phosphoric acids of the pH acid solution mixed with 200 ml of filtrate would be .25N. This acidity must be controlled or the permanency and color will be impaired.

If silicon is not desired on steels, filtration may be eliminated. Crystals may be dissolved and diluted to master solution (250 ml). This time saver may be used on other ferrous materials unless carbon and silicon interfere.

Advantages offered by this method are as follows: Silicon determined from the oxidized solution and manganese, phosphorus, and chromium from the filtrate. This requires one balance weighing for four determinations and completes chromium, manganese, and silicon in 30 minutes. Phosphorus is complete in 45 minutes. Operating costs are also lowered, this meaning that more analyses can be made with the same personnel.

FOUNDRY PRACTICE IN ARGENTINA

(*Continued from page* 73)

number of 140, with approximately 40 per cent of the grain passing through the 140 mesh sieve. In some foundries additions of this material are made to the used sand heaps at intervals, so that it is not uncommon for a sand heap for general gray iron casting purposes to have a moisture content of 10 to 12 per cent, compressive strength of from 8 to 10 psi, and a permeability of 5 to 7 (AFA). General practice is to pour the metal cold, so as to avoid difficulties resulting from the action of molten metal on wet sand to form steam.

As a result of a study of available molding sands, synthetic sands have been adopted in several foundries (there are only five sets of sand testing apparatus in the country). A clean sand having an average grain fineness of 50 was found

on the government penal island, Martin Garcia, located in the river La Plata. At about the same time a splendid deposit of bentonite was located in the province of Mendoza, about 700 miles west of Buenos Aires . Tests performed on this bentonite clay indicated that its bonding characteristics and behavior are very similar to the United States western bentonites. The sand from Martin Garcia blended with the tierra colorada also gives a very suitable molding sand for gray iron.

There are natural molding sands whose properties indicate their suitability for molding gray iron and steel, but these deposits are too far from Buenos Aires

Nonferrous sands are similar to the iron sands in that the moisture content is very high and the permeability is very low. These sands are blended by mixing a clean fine-grain sand (150 grain fineness number) with the previously mentioned tierra colorada. A good sand for molding nonferrous purposes has resulted by mulling about 5 per cent bentonite with the clean sand of 150 grain fineness.

Import Coke From South Africa

Source of raw materials for the cupola varies. At present coke is being imported from South Africa. Coke also has been shipped from the southern part of the United States. A by-product of the Argentine petroleum industry is also available, although this grade of petroleum coke runs about 30 per cent volatile matter. When fired in a beehive oven, this petroleum coke has a dense structure and performs very well in the cupola, not only yielding high carbon irons, but giving high temperatures as well. However, during re-coking in the beehive oven, the coke loses about 50 per cent of its original weight. The cost of the coke at the refineries is about $17.50 (USA) per ton, and after re-coking sells for $40 (USA). There was a period during the war when coke commanded as much as $500 per ton!

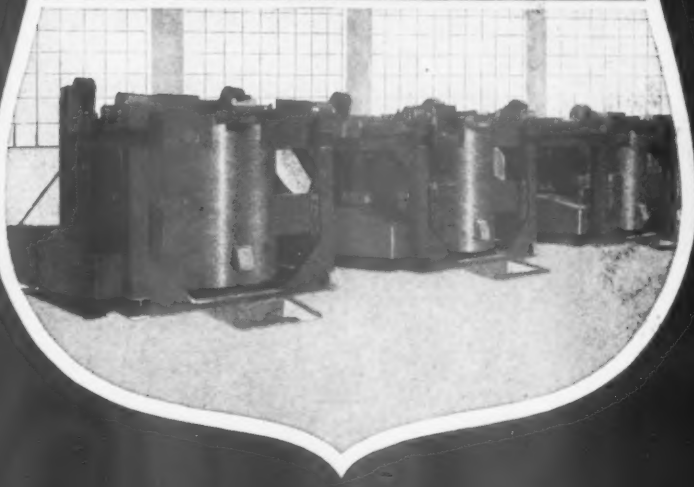
Pig iron stocks disappeared completely during the war, and at present pig iron is imported from Brazil. It retails in Buenos Aires for around $90 per ton.

Argentina has rich iron ore deposits in the Andes mountains. These mountain form the western frontier of the country. There are also a great number of coal deposits, but it is said the coal is not of suitable coking quality for metallurgical purposes. However, about a year ago, the Argentine government began operating a blast furnace in the province of Ju Juy, about 1200 miles northwest of Buenos Aires. The operations are supervised by a Swedish engineer, charcoal is used as a fuel, the daily output is approximately 70 tons, and the resulting pig runs over 1 per cent P and less than 0.01 per cent S.

(*Continued on page* 186)

HAUSFELD FURNACES

FOR GAS OR FUEL OIL



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BRASS • ALUMINUM • MAGNESIUM
AND ALL OTHER
NON-FERROUS ALLOYS

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300-320 MOORE ST. HARRISON, OHIO

MODERN SAND HANDLING AND A MOTIVE "SLINGER"

Both are providing excellent results in greater production at lower cost for Banner Iron Works

A condensation of an article from Better Methods, the monthly magazine of The Beardsley & Piper Company

This Motive Jr. Sandslinger saves ramming time, increases output and reduces production costs for Banner Iron Works, St. Louis, Mo.

The Sandslinger gets its sand supply from the overhead hopper.

Fast, efficient sand handling and ramming . . . shake-out to mixer to Sandslinger to mold. That's the way Banner Iron Works in St. Louis does it!

Shake-out sand goes via conveyors and elevators to magnetic separator and rotary screen; then to storage bin and, after conditioning, to the overhead

(*Continued on next page*)

MODERN SAND HANDLING . . .
(*Continued from previous page*)

Sandslinger hopper. Required amounts of sand are released into the "Slinger's" tank . . . and it's ready to ram.

The Sandslinger at Banner is a Motive Jr. which operates up and down a 150 ft. long track and rams molds on

One of Banner's larger molds rammed by the Sandslinger.

both sides. Banner has a great variety of sizes and types of floor molds but the Sandslinger rams them all quickly and uniformly. Accurate time studies prove conclusively that the "Slinger" has made remarkable savings in time and costs.

Banner really *works* its Sandslinger . . . the sand system keeps it supplied . . . proper arrangement of molds and good housekeeping provides orderly production.

4900 lb. casting made in a 7' x 14' flask . . . rammed by the Motive Jr. Sandslinger.

No other machine rams as hard—as uniformly—as fast. *In fact, no other machine actually rams!* The *flexibility*—the *efficiency* of the Sandslinger is outstanding!

Write today for complete information: The Beardsley & Piper Company, 2424 North Cicero Avenue, Chicago 39, Illinois.

SANDSLINGERS

- Speed Mold Production
- Ram Hard & Uniformly
- Ram Molds of all Sizes & Shapes
- Save in Metal, Floor Space, Direct Labor Charges and Cleaning Time

There's a Size and Type of "Slinger" to meet your individual foundry needs!

Write today for catalog!

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CHICAGO 39, ILLINOIS

It's a B & P Product! Sandslinger • Speedslinger • Speedmullor • Screenarator • Mulbaro • Sand Conditioning Machine • Champion Flask Lift Machine

(*Continued from page* 183)

In the absence of pig iron, cupola charges normally consist of foundry returns and agricultural, machinery or automotive scrap. Motor blocks command as high a price as pig iron at present. Some gray iron foundries strictly prohibit the use of steel scrap in the cupola charge, whereas others add only steel scrap to foundry returns to obtain the required volume of metal for pouring. Ferromanganese and ferrosilicon are added in appropriate quantity to produce an iron of the desired characteristics.

Cupolas vary in size from 20 to 42 in., the majority being in the smaller diameter range. Construction of cupolas varies widely. Some have been observed with a continuous tap hole in the center of the bottom door. Others have an extremely low effective height, with the result that two or three charges completely fill the cupola. The stack in some is constricted to a small diameter which results in most of the flame coming out the charging door. In others there is no noticeable difference in appearance compared with the typical cupola used in the States. Some cupolas are equipped with mechanical charging devices.

Employ Modern Methods

In some large foundries the technique is well advanced. One of these foundries exercises rigid sand control for its production work, and produces a high grade of Meehanite iron. Another foundry is equipped with a sandslinger for molding bath tubs. This latter foundry also produces a high tonnage of centrifugally spun cast iron pipe.

Steel is melted for casting purposes in direct arc furnaces, in converters and recently a high frequency induction unit has been placed in operation. The author had the privilege of visiting a steel foundry in which the owner had designed and built his own electric arc furnaces and also manufactured his own carbon electrodes. The furnaces were of 600 lb capacity each, acid lined, with only one electrode entering through the roof. The tapped metal appeared very hot, poured well, and the resulting castings were very sound.

The molding material in the steel foundry is a finely crushed silica rock bonded only with molasses water. No clay is used. After the mold is rammed up, it is thoroughly dried or baked and then assembled for pouring. A real problem confronts the molder should it be necessary to make a patch.

Problems in the nonferrous foundry are not so troublesome. Melting is usually done in crucible melting units and barrel type flame-fire units. The writer

Workers Work Better in Fresh Air

There's no secret about the many benefits of clean, fresh air in foundries. Probably no other single factor contributes more to improving production—both in quality and quantity. Certainly nothing that costs so *little* does so *much* to keep workers healthy, happy, on the job.

Good ventilation makes foundries good places to work. And good ventilation means just one thing—*air movement.* Smoke, fumes, dust, and moisture disappear like magic in the powerful suction and strong exhaust of *double-action* Propellair airfoil fans.

Both blade surfaces work—the back even *more* than the front—and scientific blade design compensates for the differences in linear speeds of points at various radii. Result: high-velocity, high-volume air flow over *whole* fan area.

Compact, easy-to-install Propellairs simplify layouts; "fit-in" most anywhere; *save money* at every turn. Ask us to show you how easily your foundry can have fresh air.

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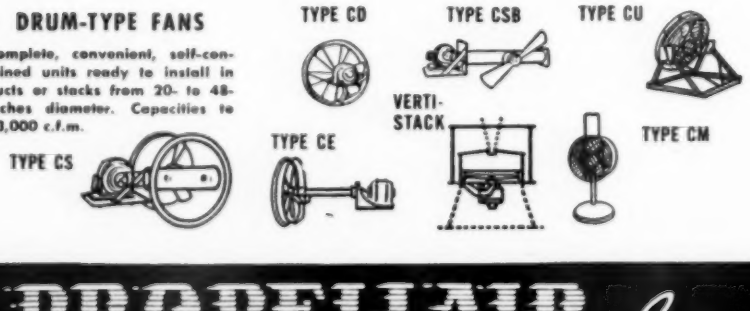
DRUM-TYPE FANS

Complete, convenient, self-contained units ready to install in ducts or stacks from 20- to 48-inches diameter. Capacities to 43,000 c.f.m.



PROPELLAIR, Inc.

SPRINGFIELD · OHIO

has seen an indirect arc melting unit and also a low frequency induction furnace. For very large castings, the cupola is used as the melting unit.

The average wage paid to foundry workers varies from $50 to $100 (US) per month. While that may seem rather low to the U. S. reader it should be pointed out that the best beef cuts are about 20 cents per lb, butter is 35 cents per lb, eggs 20 cents per doz, potatoes are 2½ cents per lb, sugar is 6 cents per lb, milk 6 cents per qt and bread sells normally for 4 cents per lb. None of these products is rationed. Transportation is relatively low in cost also—subways, street cars and large buses charge 2½ cents per ride.

In general, one is impressed by the quality of the foundry product made considering the equipment and material available. Even in the smallest foundries and where the practice appears most primitive, a casting of surprisingly good appearance is produced. It is true many of these castings are only shapes, but there are never any service complaints. There are foundries in which the procedure is guarded with great secrecy.

One of the tools most needed in Argentine foundries is more technical information regarding materials, melting practice and molding procedure. A great field exists for an organization like the American Foundrymen's Association and a publication like THE FOUNDRY. To do the greatest good, publications would necessarily have to be written in Spanish.

Foundry Coke Study Is Planned

In an effort to establish a prior-to-use method of evaluating cupola coke quality, the cupola research committee of the American Foundrymen's Association will sponsor an intensive study of foundry coke quality and behavior, R. G. McElwee of Vanadium Corp. of America, Detroit, committee chairman, has announced.

As a first step, the project will seek a basis of correlating coke properties with actual operating experience by analysis of data to be acquired under actual melting conditions in a number of co-operating foundries. These data, covering such factors as fuel ratios, air volume, analysis of effluent gases, melting rates and metal temperatures, slag, type of metal produced, cupola construction and the like, will be collected, integrated and analyzed by a research worker to be employed by the committee. Field studies are to be supplemented by laboratory investigations where indicated.

Coke used as the operating data is gathered will be subject to the usual chemical analyses and to shatter, density,

PREPARES SAND THOROUGHLY AT LOW COST!
Screenarator! Lowest Cost Portable Sand Conditioner! Ideal for Small, Medium and Large Foundries!
Height and angle of screen makes shoveling easy. Discharging of conditioned sand controlled to place it any desired distance within 25 ft.
THE SCREENARATOR

The operator easily moves Screenarator to desired position from floor to floor. Electrically operated, it plugs into an available power outlet.

The Screenarator thoroughly screens the sand . . . frees it from core butts, gaggers and other foreign matter. It cuts and breaks lumps, aerates the sand, and then aerates it for the second time when it piles the conditioned sand wherever desired.

Remember . . . sand quality determines casting quality. Proper sand preparation is of utmost importance to foundries . . . so get more information on the Screenarator today. Write for catalog.

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. . . with a SECO Vibrating Screen

● Contrast the drawing above with the unretouched photo of a Seco vibrating screen moving at 1050 R. P. M. Here is conclusive proof (note the pencil and washer on the base frame are unshaken) that Seco keeps all of the vibration in the live body . . . where it belongs. Note also, if you have a magnifying glass, that there are many little circles visible on the side plates. These indicate that the screen's motion is in true circles, with no distortion. No wonder operators everywhere report increased tonnages on all types of screening jobs with these dependable Seco vibrating screens. Write for "A Guide to Better Screening." Dept. G.

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rumble, cell structure and other physical tests. To obtain controlled coke of known heredity and careful sizing for the field tests, the committee is seeking the cooperation of producers.

As nearly as practical, data developed by the project will be issued as quarterly reports and, after committee review, will be the basis for further studies.

First of the committee's projects of a strictly research nature, the study is to be financed by the association's cupola research fund, originally created by subscription and maintained by sales of the committee's *Handbook of Cupola Operation.*

In its chapter on foundry coke the handbook points out that "contradictory reports on the effects of specific properties of coke have resulted from inability to correlate many coke properties with actual operating experience. One reason for this difficulty has been lack of sufficient data. This situation must be corrected if an index of coke quality, prior to its use, is ever to be attained. This end can be accomplished only by extended, systematic studies of coke properties and their relation to actual cupola operation under commercial conditions."

Members of the committee, in addition to Mr. McElwee, are A. L. Boegehold, head, metallurgical department, General Motors Corp. research laboratories, and E. H. Stilwill, chief metallurgist, Chrysler Corp., Dodge Division, both of Detroit; H. Bornstein, director, testing and research laboratories, Deere & Co., Moline, Ill.; E. C. Jeter, foundry metallurgist, Ford Motor Co., Dearborn, and A. E. Schuh, director of research, U. S. Pipe & Foundry Co., Burlington, N. J.

Offers Payroll Tax Savings Data

Payroll division of Research Institute of America Inc., New York, has prepared a 48-page analysis, "How to Reduce Payroll Taxes Under Merit Rating," for distribution to those interested. It provides a checklist of 72 payroll tax savings, tables showing disqualification rules and method of charging benefits against employers for the 45 merit rating states, rate formulae for states using reservations, benefit ratios and benefit wage ratios, and an analysis of compensable separations and tax credit systems.

A section on miscellaneous tax-saving recommendations covering methods of computing voluntary contributions, appeal of improperly computed rates, pay adjustments at time of rate change, coverage of workers in other states, how to get voluntary coverage, and allocation of retroactive payments and use of joint accounts are contained in the analysis.

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Plenty of power and speed—teamed with smooth, dependable operation—gets more work done in less time—with greater accuracy. Rugged Thor Grinders and Sanders handle all types of metal removal with maximum economy . . . available in sizes and models from tiny mounted points for fine, close work in tool and die shops to 8" diameter wheels for heavy duty production grinding—in a speed range from 3,000 to 20,000 r.p.m. Positive air control provides instant starting and steady power. Thor's quick-acting automatic governor controls rotor speed under all loads.

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PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

The adventures of BILL

By PAT DWYER

Drawings by RICHEY

EVERY trade and every profession has its own legends and traditions, handed down from generation to generation and circulated from district to district by a form of grapevine telegraph that appears to be the common property of every race of people—white, yellow, red and black and all the shades in between. The foundry is no exception to the general rule. As with bees carrying pollen from flower to flower in nature's great scheme of fertilization, touring members of the foundry craft relate their stories in whole or in part at every stopping place. The local boys adopt them, trim them here and there to fit local conditions and characters, but fundamentally the stories are the same irrespective of nationality, time or place.

An Australian foundryman told me a story I first heard in Nova Scotia. Years after I had heard the Alabama Negro story of the ventriloquist at the funeral, a professor from the University of Upsala gave me the version current among Swedish foundrymen. I heard an Italian engineer tell of the immense American mold on which 100 men worked for six months. It was so large that at casting time, two men on horseback raced around the perimeter in opposite directions touching off the vents. After the mold was closed one of the molders missed a pet lifter. An apprentice was lowered down through one of the risers to search for it. He wondered around and got lost among the cores and they had to send a bloodhound down to find him. In another version a St. Bernard dog with a flask of brandy strapped to his breast was sent down. Boy and dog lapped up the contents, and were found later by a second seaching party fast asleep and locked in each other's arms!

In still another version, old gaffer Ironjaw wanted to pour the job right away. He claimed that one little grimy apprentice more or less never would be missed. The men protested violently. They were paid only for good castings. The young cub was filled with wind and soap suds like a barber's cat, or a radio singer, Without doubt if he was left in the mold, some of this undesirable foreign material would be tapped in the metal and come to light only when the machinist was taking the last finishing cut.

"How would you like," they said to the gaffer, "how would you like to have the machine shop boss invite you to come over to the shop to see a casting with more holes in it than a Swiss cheese, and a special hole in one section, big enough to bury a dog. How would you like that, hey?"

Stories of metal that run out of a mold and disappeared pop up periodically. Some of these stories of course are legitimate, as for instance the story of the lead pipe casting in a West coast foundry a few years ago. The casting was all ready to be shipped in the morning. During the night the shop was destroyed by fire. Explorers in the ashes finally discovered where the heat had melted the casting and the metal had run down a rat hole, or a crack or an opening in the floor.

While Englishmen generally practice, and rather enjoy, a reputation for reserve and conservatism, some members in the foundry field have a go with the long bow occasionally. In this they differ from the literary section of the community which unanimously deplores the type of humor favored on this side of the Atlantic, based principally on gross exaggeration, vulgar horseplay and rough, crude western stuff. Despite all this, some tall tales slip past the censor and become incorporated in the warp and woof of foundry tradition. A typical sample deals with a huge casting made in a Sheffield foundry. Three cranes and three big ladles on the job. Ladles were emptied without any sign of metal in the risers. Ladles were rushed back under the cupola spouts and three air furnaces were tapped. All the metal was poured into the mold. Still no metal in the risers. A hurried call to a neighboring foundry brought over all the available metal in the place. This also was poured into the mold with the same result.

The manager—like Mark Twain's bluejay—declared he would fill'er up if he had to melt every pig and every pound of scrap in the yard. He was stopped by a frantic telegram from the mayor of Doncaster 20 miles down the river: HEY FOR THE LUVAGOD LAY OFF YOUR SILLY ANTICS. STREAM OF IRON IN MIDDLE OF RIVER RAISED WATER TO BOILING POINT. INHABITANTS OF BURNING HOUSE SCALDED WHEN FIREMAN TURNED HOSE ON THEM. SURFACE OF RIVER COVERED WITH BOILED FISH. MASS MEETING IN TOWN HALL EXPRESSED EXTREME ANNOYANCE. BREWERY SHUT DOWN AND ALL PUBS CLOSED. SITUATION DESPERATE. STOP AND THIS MEANS STOP.

Discussing this subject with Bill I mentioned the peculiar human characteristic which caused molders to view with equanimity and in some instances actual hilarity the loss of a casting. Obviously where a man is working on a piece-rate basis this does not apply. The hilarity appears only when a colleague loses a casting, or more particularly where the boss or owner of the establishment has to stand the loss.

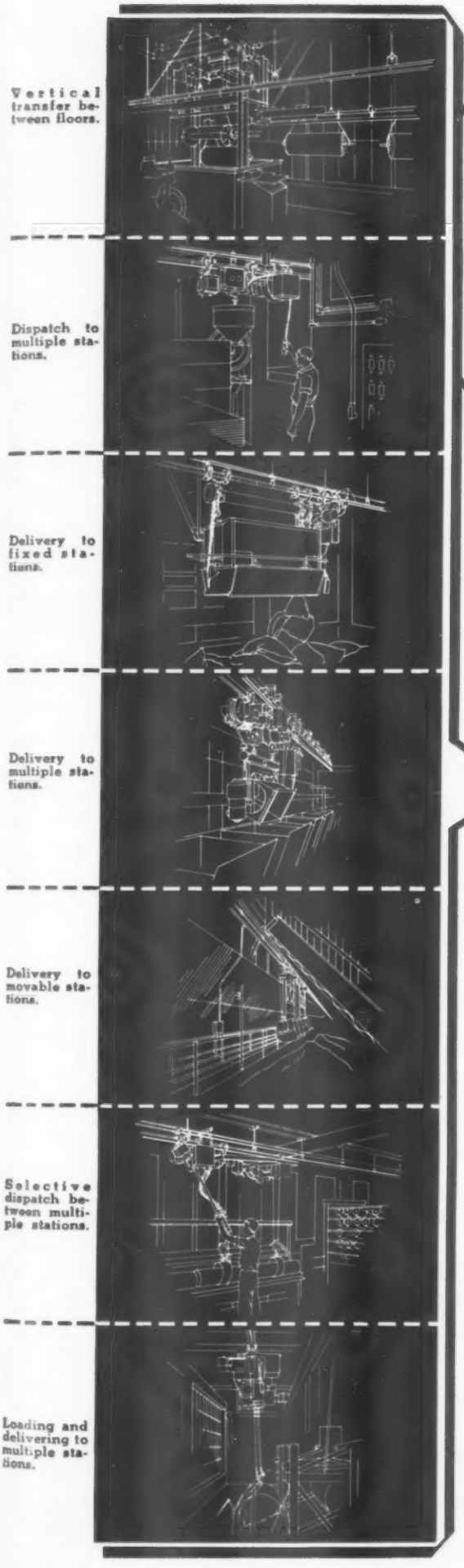
"By an extremely remarkable coincidence," Bill exclaimed, "the other day I had a sketch from a friend of mine on the West coast illustrating this very subject."

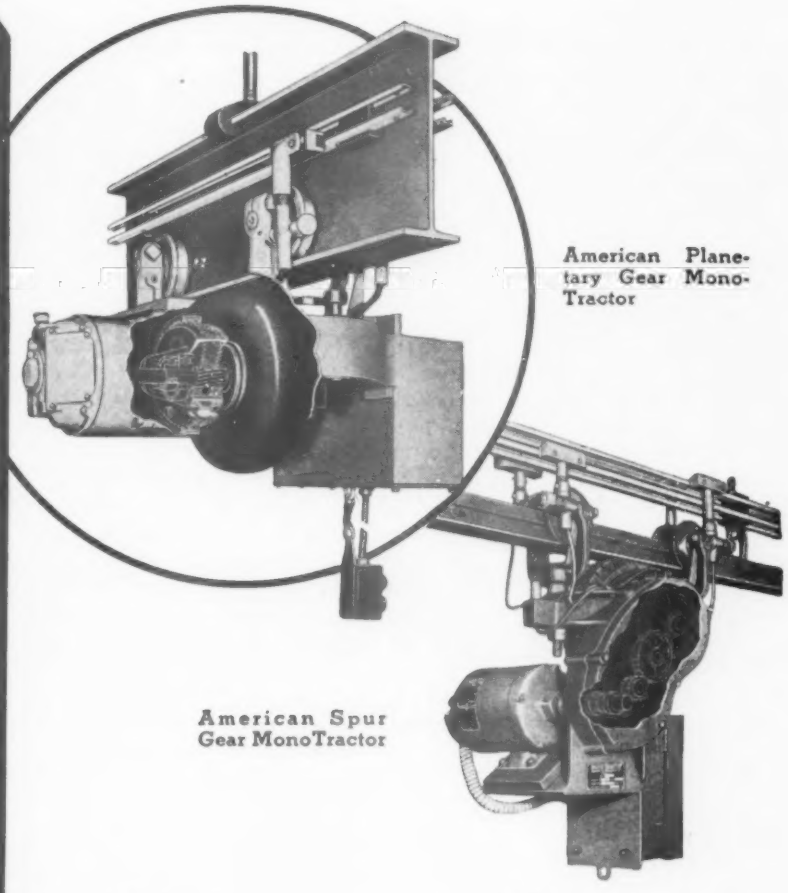
He extracted the rolled-up sheet of paper 11 x 12 in. from a hip pocket and re-rolled it in the opposite direction on the table to form a flat sheet. An attached note bore the message: Dear Bill, I am sending you a copy of a cartoon one of the boys in the shop drew after the incident took place. Needless to say it aroused some spirited comment, especially from those whose likenesses appeared in it.

"Without doubt," Bill remarked, "the artist is a highly skilled and observant foundryman. His tolerance and generosity are shown by the fact that he has in-

(*Continued on page* 192)

The flight of the Bumble Bee


Vertical transfer between floors.
Dispatch to multiple stations.
Delivery to fixed stations.
Delivery to multiple stations.
Delivery to movable stations.
Selective dispatch between multiple stations.
Loading and delivering to multiple stations.



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A 56-page book showing successful applications of American MonoRail Systems.

THE AMERICAN MONORAIL COMPANY

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(*Continued from page* 190)

cluded the entire shop crew, one half on the typical foundry ladder with broken rungs, and the other half in an intricate and acrobatic pyramid, anatomically correct and balanced and worthy of a place under the Big Top in any circus.

"An entirely new and radical technique in certain phases of foundry practice, a technique that probably will revolutionize existing methods of handling molten metal is depicted with great skill and fidelity in the operation of the bucket brigade. The system also has marked economic features. In ordinary foundry practice when metal bursts through the side or end of a flask and runs all over the floor, it is allowed to run, while the men also run to get out of the way. In this new and improved technique a bucket brigade—no doubt carefully trained—swings into action. The metal is caught as fast as it pours through the hole, passed aloft from hand to hand and poured into the runner basin.

"In many foundries it is customary to *flowoff* a greater or lesser amount of metal through the risers after the mold is filled. The theory back of this performance is that by keeping the metal in motion, any loose dirt or gas inclusions will be carried away by the flowing stream of metal. Sometimes the theory is justified by results. In other instances the bubbles and dirt, through sheer inanimate perversity, cling to the cores or the sides of the mold and refuse to budge. In addition to this feature they also remain cunningly hidden when the casting is shaken out and while it is passing through the cleaning room. Sometimes they escape the machinist, who usually may be depended on to detect any flaw minor or major. Just like a dentist going over your teeth with a flash light and an ice pick. The champion defective casting is the one that conceals its secret during an elaborate machining program and confesses only when it is filled with air or liquid under high pressure. A stream of bubbles from the air test, or a quantity of liquid varying from a few coy drops to one or more definite squirts, are sufficient to send the casting back to the cupola, instead of a designed and definite place in the field of industry.

"In the new technique, as shown in the illustration, with an empty ladle over the top, all the metal is poured into the mold. It promptly runs out through a hole at one side near the bottom and presumably carries all bubbles and floating foreign material with it. In other words, if I may be pardoned for coining an original phrase, the first metal simply serves as a wash to thoroughly clean out the mold. A screen (not shown) at the runout hole catches all this dirt while the clean and purified metal runs into the pails. In addition to the cleansing action the first metal heats the interior walls of the mold and thus promotes progressive and directional solidification by providing uniform temperature in the sand which comes in contact with the molten metal. Without doubt, although this feature has not been explored throughly, the heat of the molten metal in slightly more than momentary contact with the walls of the mold, actually dries or bakes the sand to an appreciable extent. In other words, if I may be pardoned for repeating a former observation, the treatment converts a green sand mold, with all its hazards, into a skin dried mold with all its well known advantages. When the metal is poured down the runner the second time, it lies in the mold as sweetly and softly as a babe on its mother's breast, and as clean as the same babe leaving the daily bubble bath."

"If you'll pardon me," I said, "for sticking in an oar, have you any idea how they stop the stream eventually? What's to stop the metal from flowing out through the hole a second time? Y'understand I am not presenting this inquiry in the spirit of criticism. I realize that these foundrymen have made vast strides which will open up a vast new era in foundry practice. I am merely consumed with legitimate curiosity to known how, where and when they stop the stream."

"What do you mean, how, where and when they stop the stream?"

"When the mold is filled, the big ladle is empty. Then she bursts out at the bottom. The gaffer yells 'All hands on deck! Man the pumps! Bucket Bridgade, On Your Toes!' You will note that in the interest of clarity I have omitted the auxiliary runs and grace notes. One of the most exciting episodes in a foundry is when a large mold runs out. I have been present on many occasions and I can truthfully say I never yet have seen the job handled in a perfectly satisfactory manner. There is no concerted or well trained action. Every person is excited. One man throws a shovelful of sand against the hole and a second man immediately throws a bucket of water and washes all the sand away. Sand, water, hunks of pig iron and blobs of molten metal are flying in all directions. If and when the runout finally is stopped

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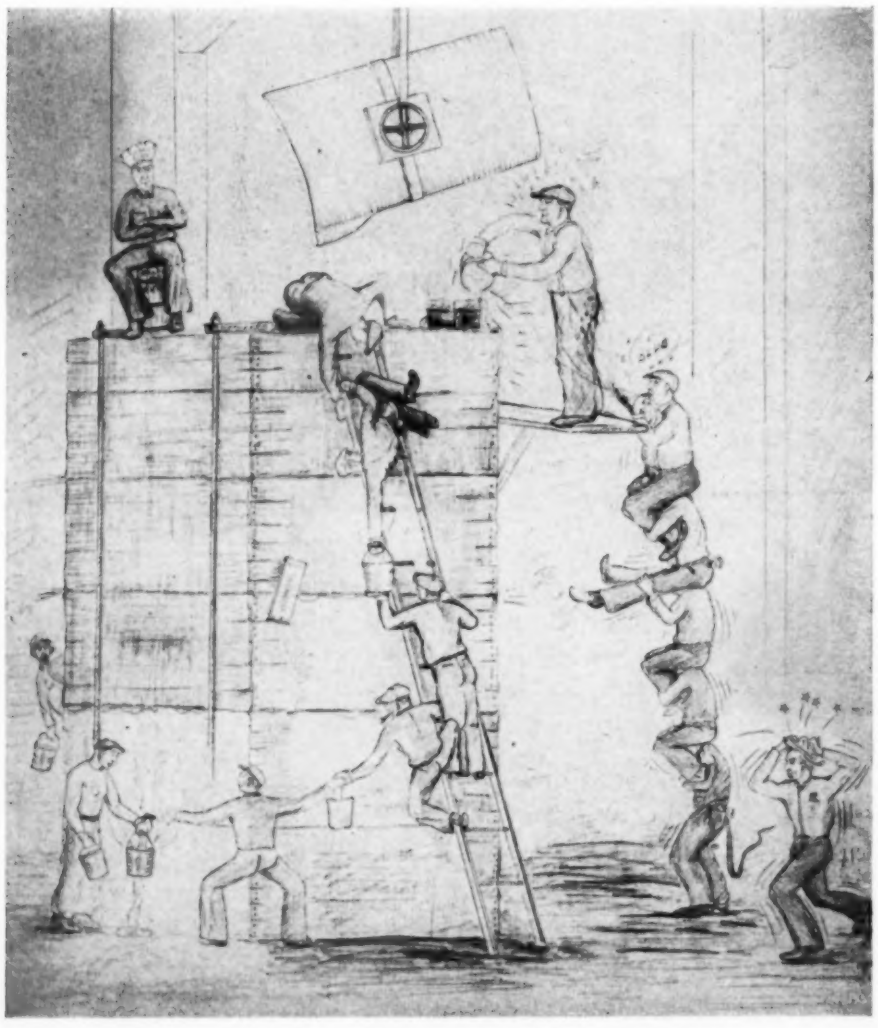


Illustration from the "Gay Cat's Guide." Runouts? So what!

NOW AVAILABLE TO EVERY FOUNDRY

MINCO BOND

NO OTHER BOND IN THE FOUNDRY WORLD CAN EQUAL ITS PERFORMANCE

When MINCO BOND is used in the system sand of PRODUCTION FOUNDRIES, the production of castings is increased at least 10% and cleaning costs and scrap losses are often decreased 50%. It does equally as well in FLOOR SHOPS and JOBBING FOUNDRIES, in STEEL, MALLEABLE, GREY IRON and NON-FERROUS.

Below are the OUTSTANDING PHYSICAL QUALITIES of MINCO BOND. In no other mineral bond in the foundry world can you purchase so much intrinsic value for your dollar.

1. HIGHEST FLOWABILITY (sand flows freely thru chutes and hoppers without clogging and sticking at all green strength ranges, high or low. Minimum ramming produces uniform mold hardness.)
2. GOOD GREEN STRENGTH (at all workable moisture ranges.)
3. HIGHEST COLLAPSIBILITY (which increases flow of castings thru shake out and cleaning equipment. Reduces shake out and cleaning costs.)
4. HIGHEST DRY STRENGTH (No other bond in the foundry world will give you high dry strength combined with high collapsibility. MINCO BOND does.)
5. MEDIUM HOT STRENGTH at pouring temperatures. (Eliminates cracked castings.)
6. HIGH DURABILITY (which still further reduces costs.)
7. NO EXPANSION AND NO CONTRACTION at room temperatures.
8. THE USE OF MINCO BOND SLOWLY INCREASES PERMEABILITY and
9. INHIBITS THERMITE REACTION which eliminates casting blows.
10. REDUCES SCRAP LOSS DUE TO SAND FAILURE.
11. MAKES SMOOTHER CASTINGS.
12. A NEUTRAL MINERAL, having a pH of 7.5 (will not foul up heaps or systems when in long, continuous use).
13. MINCO BOND IMPARTS ALL ITS FAVORABLE QUALITIES TO ANY OTHER BOND WITH WHICH IT IS USED and
14. BECAUSE OF THIS ABILITY ITS USE INCREASES THE PRODUCTION OF CASTINGS AT LEAST 10%.

An excellent facing for MALLEABLE and GREY IRON, floor and jobbing, foundries:

All burned sand
Two parts MINCO BOND
One part Western Bentonite
Ten parts above, sand and bond mix, to one part sea coal.
Use enough of the bonds given above, more or less, but always in this proportion to get approximately 8 lbs. Green Compression Strength.

Moisture Green Sand	3.5% to 4.5%
Moisture Dry Sand	5.5% to 7.5%

The use of the above facing simplifies your work. Simply increase the moisture for Dry Sand work. You will have a hard mold when dried, free of cracks, and which will shake out clean and free of lumps. When necessary the mold can be easily and quickly patched.

STEEL FACING SAND, for green, skin dry and dry sand molding:

Large Castings:

800 lbs. crude silica sand
200 lbs. silica flour
30 lbs. MINCO BOND
15 lbs. Western Bentonite
10 lbs. Cereal Binder
Use 5% to 6% moisture. Ram mold hard.
The Mold can quickly be patched if necessary.

The above formula is based on the use of Ottawa Crude Silica Sand, which has a small proportion bond in it. If a washed Silica Sand is used, increase the bonds, but in the same proportions as given above.

Small Castings, the same, only wood flour can be used in place of Cereal Binder.

Note:—It usually takes many hours to make large green sand molds. Sometimes a green sand mold is made one day and poured the next, causing the high moisture in this green sand facing. Where green sand molds are made and poured within a few hours, carry moisture at approximately 3%.

MINCO BOND in NON-FERROUS FOUNDRIES:

MINCO BOND is doing an outstanding job in the production of non-ferrous castings. Simply spade or cut MINCO BOND into the heap and in sufficient quantity to make the sand as workable as you desire it. There will be no lumps after using, shake out will be free and castings clean and smooth.

Some large non-ferrous foundries place a bag of MINCO BOND on the floor at the end of each heap. If the heap is too wet or has not enough strength, the molder shovels a few shovels of MINCO BOND thru the end of his heap and proceeds to use the end of the heap as a facing.

A good BRASS and BRONZE facing:

5 parts burned heap sand (sand with no strength n it)
1 part MINCO BOND
4% to 4.5% moisture.

1500 lb. brass castings can be made with 5 parts Vassar or Juniata bank sand and one part MINCO BOND.

ALUMINUM sand facing:

5 parts burned heap sand or new fine sharp sand
1 part MINCO BOND
Add approximately 1% wood flour
4% to 4.5% moisture
Add or reduce wood flour enough to keep casting free of wrinkles, cuts or buckles, on cope or drag.

Wood flour used with MINCO BOND in synthetic sand for aluminum production systems will keep the system sand free of black lumps and will eliminate all cuts, buckles and wrinkles, etc. on the flat surfaces.

MINCO BOND throws out 15% inhibito when in contact with high temperatures which stops the thermite reaction in aluminum casting.

MINCO BOND S SOLD WITH SERVICE AND GUARANTEED.

Write for our booklet.

MINCO PRODUCTS CORPORATION

SAGINAW, MICHIGAN

WARNER R. THOMPSON CO.
7328 Hamilton Ave., Detroit, Mich.

THE BUCKEYE PRODUCTS CO.
7020-34 Vine St., Cincinnati, Ohio

MARTHENS COMPANY
1205—4th Ave., Moline, Ill.

FOUNDRY SUPPLIES CO.
481 W. 53rd St., Chicago, Ill.

THE HOFFMAN FOUNDRY SUPPLY CO.
1193 Main, Cleveland, Ohio

THE FOUNDRY SUPPLY CO., INC.
2295 University Ave., St. Paul, Minnesota

WOLVERINE FOUNDRY SUPPLY CO.
3211 Bellevue, Detroit, Mich.

WM. R. BARNES COMPANY, Ltd., 243 Cumberland Ave., Hamilton, Ont.

MOLDEN Ltd., 501 Murray St., Montreal, Quebec

SHANAHAN'S LIMITED, Vancouver, British Columbia

SHANAHAN'S LIMITED, Winnipeg, Manitoba

INDUSTRIAL FOUNDRY SUPPLY CO., Inc., San Francisco, Calif.

INTERSTATE SUPPLY & EQUIPMENT CO.
947 W. Virginia St., Milwaukee, Wisconsin

INDEPENDENT FOUNDRY SUPPLY CO.
2325 East 38th St., Los Angeles, Calif.

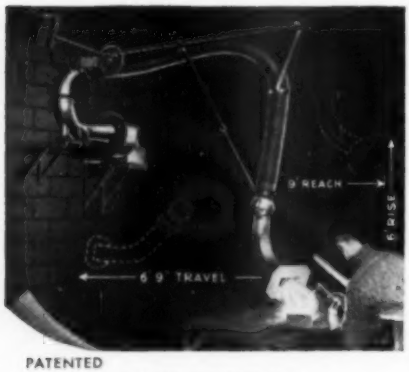
PETER J. DAPKUS
640 Atlanta Ave.,
Webster Groves, Missouri

Why the RUEMELIN FUME COLLECTOR *is a* REAL NECESSITY

● *THE OLD WAY*

● *THE NEW WAY*

SOME PROMINENT USERS —
SANTA FE RAILWAY SYSTEM
PENNSYLVANIA RAILROAD
INTERNATIONAL NICKEL COMPANY
JONES-LAUGHLIN STEEL COMPANY
NEW JERSEY ZINC COMPANY
MORGAN-SMITH COMPANY
ANCHOR HOCKING GLASS CO.
SINCLAIR REFINING COMPANY
INLAND STEEL CORP.
OLIVER IRON MINING CO.
NATIONAL LEAD COMPANY
MASSEY HARRIS COMPANY
MARQUETTE CEMENT MFG. CO.
MAYNARD ELECTRIC STEEL CASTING CO.



PATENTED

TWO MODELS!

- Long reach Model D-5342 — ideal for large welding booths; reaches out 15 feet from wall.
- Standard Model D-5310—used for standard welding booth ventilation; hood reaches out 9 feet from wall.

The Ruemelin Welding Fume Collector has been specially engineered to eliminate noxious fumes. The inlet hood maintains a constant high velocity over the working area, quickly removing heat and smoke *at the source.* Welders equipped with this device are assured of a clean shop atmosphere; the manufacturer gains by increased daily production.

The fume collector hood can be instantly placed where needed anywhere in the booth welding area. No tedious adjustment necessary. Just pull the inlet hood to the welding position and you are ready to go. Approved by state industrial commissions and by compensation insurance companies. Many users send in repeat orders. Write for bulletin 37-C today.

RUEMELIN MANUFACTURING CO.

3850 N. PALMER ST. • MILWAUKEE 12, WISCONSIN

Manufacturers and Engineers of Sand Blast and Dust Collecting Equipment

(*Concluded from page* 192)

the ladle is empty and no metal is left to fill the mold. That is the reason I ask how this apparently well trained crew handles the job."

"Well," Bill admitted, "I regret that on that particular point, my correspondent failed to take me into his complete confidence. The prime motive of the cartoon centers in the cause of all the trouble, the crowned lad sitting on the nail keg at the extreme upper left with the inscription *Runout King* on the front of the crown. Calmly and nonchalantly he gazes on the scene of super-activity with the following cheerfully cynical comment: 'So long as I have one good runout a day, I'll never lose my crown!'

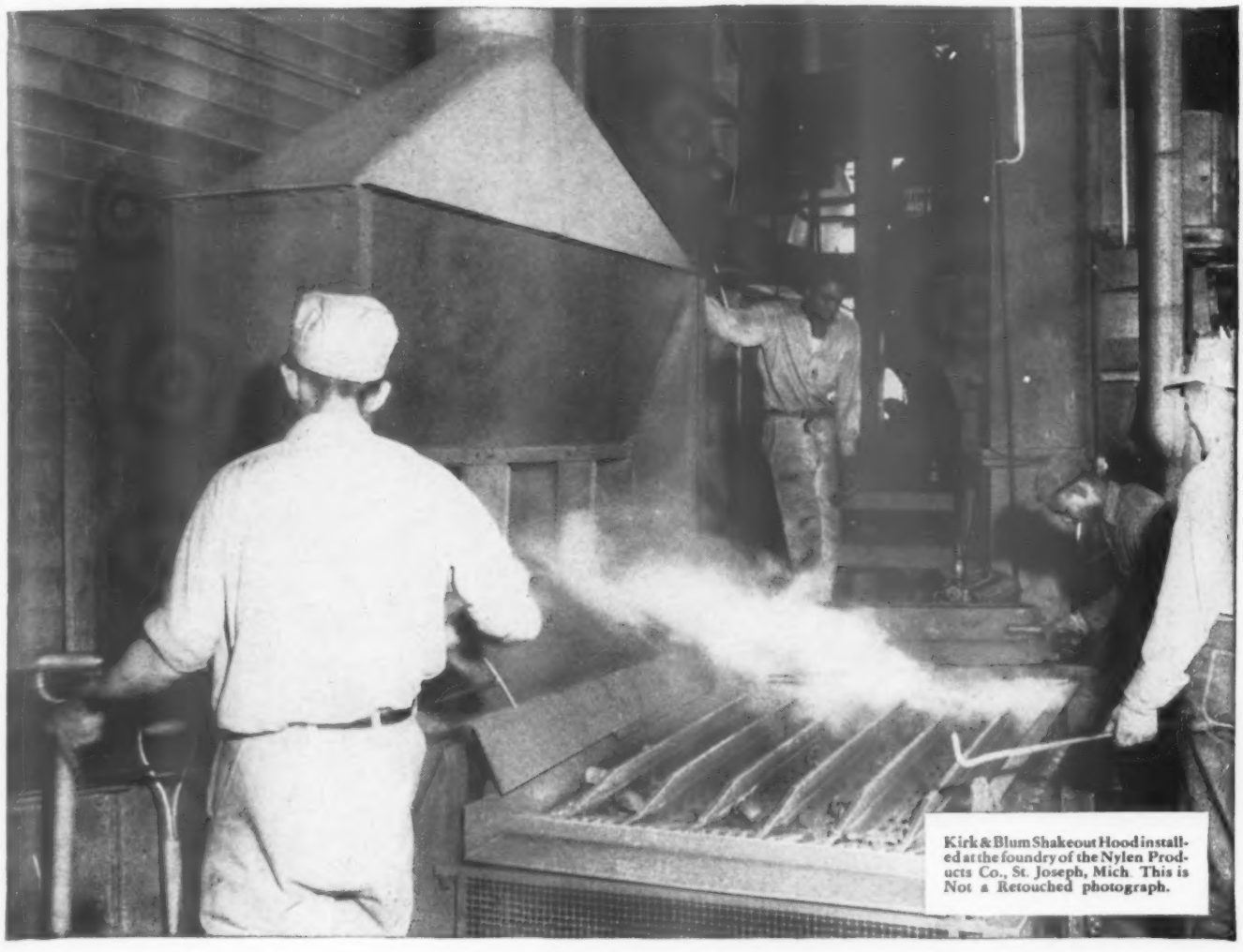
"The only person who does not enter enthusiastically into the prevailing spirit is the unfortunate gaffer in the lower right corner. How do I know he is the gaffer? He has three pencils in his shirt pocket. He needs neither pencil nor paper to figure the cost of this Roman holiday."

Employees Honored For Long Service

Fourteen veteran Cleveland employees of National Malleable & Steel Castings Co. received gold watches in honor of 40 years of service at the third annual dinner meeting of the general office chapter of the Naco Service Society held recently. The occasion also celebrated the election of Cleve H. Pomeroy as company president. The 14 who received watches are James A. Slater, John Merrell, John Schuch, W. W. MacMillen, John J. Jaschka, Harry A. Schwartz, Harry E. Orr, Frank R. Anderson, George B. Daugherty, John Eler, Alfred M. Zuercher, George F. Wilhelmy, Leroy L. McKee and William Blackmore. Robert L. Breyley and Thomas E. Newberry were given pins and certificates of admission to the society, which is limited to employees of 15 or more years of service with company.

Engineering Firm Publishes Booklet

George Fry & Associates, 135 South La Salle St., Chicago, consulting management engineers, have published a 40-page brochure entitled, "Production Decalog." The booklet outlines ten essential elements of an effective production engineering program: Supervisory training, plant layout, methods improvement, job evaluation, employee selection, employee training, work measurement, wage incentives, production control and cost control. Services offered by the company are explained.

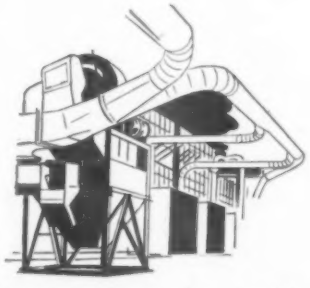


Kirk & Blum Shakeout Hood installed at the foundry of the Nylen Products Co., St. Joseph, Mich. This is Not a Retouched photograph.

KIRK & BLUM AIR ENGINEERING

. . . provides effective Ventilation of Shakeout

K & B Engineers determine the pipe sizes and correct location of the hood opening.



K & B Engineers select the right type of exhaust equipment to produce the desired airflow.

● Foundry men agree that of all dust sources, the shakeout is by far the worst and most troublesome. Without adequate control of dust and fumes at the shakeout, other forms of foundry ventilation are of little practical value.

Knowing these facts from extensive experience, Kirk & Blum have long specialized in the planning, designing, and installation of efficient and dependable systems for the control of shakeout dust and fumes. Like all K & B installations, these systems are *correctly engineered and custom-built* to fit the individual job —and guaranteed to provide *maximum efficiency at minimum operating cost.*

For complete details, including names of leading foundries utilizing our services, write us at the address below.

THE KIRK & BLUM MANUFACTURING CO., 2808 Spring Grove Ave., Cincinnati 25, Ohio.

KIRK AND BLUM

K & B Engineers design the equipment to provide for proper clearance, safety, and visibility of crane operators.

The actual installation, made under rigid engineering supervision, is carefully scheduled to assure minimum interference with foundry operations.

PACKAGED AIR FOR INDUSTRY

Packaged air . . . when and where you need it . . . is always there when you have a stationary or portable Schramm Compressor. Designed for rugged, reliable duty, Schramm Compressors give a continuous flow of air with a minimum of maintenance. Of special advantage to the Industrial Engineer are these Schramm Compressor features:

1. **Completely watercooled to provide ideal performance in winter as well as summer.**
2. **Main bearings for every cylinder.**
3. **Mechanical Intake Valve.**
4. **More cylinders and lighter parts.**
5. **Forced feed lubrication.**

Make your compressed air problems easier by using Schramm Air Compressors. Write today for construction details on these rugged, reliable units.

SCHRAMM INC.

THE COMPRESSOR PEOPLE

WEST CHESTER

PENNSYLVANIA

GETTING AND KEEPING FOUNDRY WORKERS

(*Continued from page* 78)

it is obviously a cheap investment and is paying an excellent return.

We give the job applicant a thorough physical examination, including an eye examination, and when we're through with him we know whether or not, so far as his physique and health are concerned, he is a good man for our kind of work.

Our procedure in the establishment of a health service seems the logical one to follow. The first thing we did was to get an able doctor—a doctor who specialized in respiratory diseases. After we had him—and it was not an easy job to find the kind of man we wanted—we laid the problem in his lap. We told him to tell us what he needed to do the kind of a job which he felt had to be done. Then we took his prescription and filled it. As a result, I believe we have an outstanding department.

A foundry's production man, purchasing agent or even its president cannot be expected to think through and install a satisfactory health service. He doesn't know how.

Leave It to the Doctor

It has been interesting to us, as other companies have come out to inspect our layout, to find them saying, "Why, we can't do that, we're not big enough." Of course not every foundry is big enough to put in the type of physical equipment which we have. But if it will get the doctor, it will find that he has intelligence enough to suggest a health service which will be entirely appropriate to the company's requirements.

The next thing we do to get the right kind of people is to see that they are put on the right kind of jobs. Some men have special skills. Some men are brawny, others are not. There's no use putting a man who weighs 130 pounds on a job that requires physical endurance. He just can't do it. He'll try it and then he'll quit. So find out what your applicant would like to do—what he has done—and then fit him into the picture properly.

Another thing we do—which is not new at all but which has been helpful—is to transfer a man from one job to another if he doesn't seem to fit where we first place him. Many a man who has been put on a job where he was unsuccessful, has been a real asset when he was transferred to something else. So don't give up too quickly. A saying around our plant is that no man is out until he's had three strikes, and we have

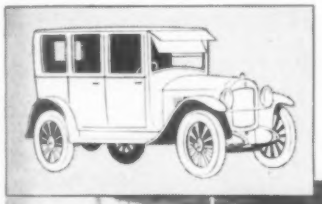
(*Continued on page* 198)

R-S FURNACE FACTS

ISSUED MONTHLY BY R-S PRODUCTS CORPORATION, PHILADELPHIA 44, PA., FOR THOSE CONCERNED WITH QUALITY HEATING OF METALS

23 Years Ago...an R-S "First" which Started an Era

Old hands in the American Society for Metals (then called the Steel Treaters) will remember this particularly famous group of 1923 furnaces. The Bureau of Mines took movies of them; "Mike" Watson, metallurgist for the user company (American Gear & Mfg. Div. of Hupp Motors) toured ASM chapters and technical colleges giving speeches about them; and Professor Trinks wrote the details of their design into his now-famous



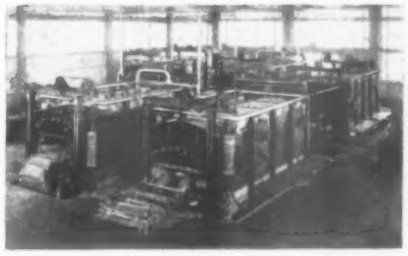
texts (see, Industrial Furnaces, Vol. II, 2nd ed., Figs. 250, 253, 256 and 279).

Why so famous?

Well, Sir, this family of four R-S furnaces made up *the very first continuous, automatic heat treating line for automotive parts*—and started the era of production-line heat treating we know today.

Here's the job they did. They took an endless stream of Hupmobile steering-knuckles and axle forgings through the harden-quench-and-draw cycle by fully mechanized means. The axle hardening furnace was an early walking-beam type. Other units in the line employed chain-conveyor and continuous-belt handling. All were oil fired. Temperature control was automatic. In fact, so young was automatic temperature control in 1923 that R-S had to build the control valve itself—one of the first such valves.

Our point is this! R-S has been around for a long time—with progressive, but practical, design sense of the brand that



makes improved production ideas work.

And if you study the photos closely, you'll see that the same principles of construction (geared door hoists, chain take-ups, ample expansion provisions, etc.) which characterize good furnace design today, characterized R-S methods 'way back in the early days of 1923.

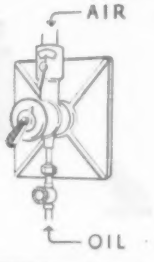
ON BUYING FACTORY-BUILT FURNACES

A furnace not built on your premises
May become, without warning, a nemesis.
Hidden faults of erection
May pass your inspection,
And assert themselves later—with emphasis.

But buy it, instead, from R-S,
And its "insides" you won't have to guess.
You can kibitz the making;
See the care we are taking
To keep year-round maintenance less.

Furnace men seem to like limericks that have to do with the business. Since starting to print them this Fall (see the October and November FURNACE FACTS), we find that there are several "bards-of-the-craft". If you're limerick-looney too, send in your contributions. We'll print them.

Tip on Oil Burner Piping



Be sure that oil branch lines approach burners *from below*. Let the air lines come down from above. Then, if shut-off valves leak or jam, drainage is in the right direction. Imagine what could happen when you light your furnace after oil has leaked *into* the furnace chamber during periods of shut-down.

It's details like this which have earned the respect the R-S nameplate enjoys.

...and Here's the Man Who Designed Them

Meet our own vice president and chief engineer, D. E. Wyman, who designed

the Hupp axle and knuckle furnaces which started the era of continuous sequence heat treatment above discussed.

For those who don't yet know Mr. Wyman, despite 33 years in industrial furnace design, it will be worth noting that, in addition to being the father of the famous Hupp harden-quench-and-draw lines of 1923, he designed the Navy's first ordnance furnaces at Pearl Harbor; led the R-S engineering crew during two world wars; is an authority on rotary, pusher and conveyor furnace construction; knows how products behave under heat (from copper spark-plug gaskets in the annealing range to forging ingots at 2300°F or hundred-ton weldments being stress relieved); and has done outstanding development work on materials handling mechanisms for high temperature service.

Since 1913 he's been active at metal-men's meetings and furnace-men's round-ups—but mostly he's home at R-S in Philadelphia working for you—making good furnaces better.

JML co P-M1

GRAND DADDY OF 250,000 BLOWERS

"That's a better blower than the fan on my foundry cupola."

The double impeller principle in Rotary Positive Blowers came from this water motor with its wooden impellers in an iron case, devised by the Roots brothers in 1854. It led to the establishment of one of our predecessor companies.

Since then, we have built 250,000 blowers, meters, exhausters, vacuum pumps and similar equipment, whose successful performance has been demonstrated in practically every industry.

For many years, we built only Rotary Positive units. Then, as new products and processes showed a growing need for Centrifugal equipment, we expanded our activities. Today, R-C *dual-ability* to supply either type gives users the advantages of unprejudiced engineering.

So, whatever your need may be for moving or measuring air or gas, and for many liquid applications, you can depend upon R-C *dual-ability* for long-time, profitable performance.

ROOTS-CONNERSVILLE BLOWER CORPORATION
One of the Dresser Industries
701 Madison Avenue, Connersville, Indiana

Roots CONNERSVILLE SINCE 1854

BLOWERS FOR EVERY NEED

ROTARY POSITIVE AND CENTRIFUGAL BLOWERS • EXHAUSTERS • BOOSTERS
LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

(*Continued from page* 196)

saved many a good man through that policy.

Finally we have exit interviews where we manage to rescue some of the people who otherwise would have walked out and who we want to keep on the payroll.

We can do a great deal more with exit interviews. Most people dislike quitting a job and starting a new one. They dislike the unknown of the new job. They would rather stay where they are, working with people they know and in surroundings with which they are familiar. We have carried the exit interview to the point where no employee can get his final check except from the head of the employment department, who talks to him before he is finally cut loose.

We are careful about our interviewers. We think it is just as important to have intelligent interviewers who know their business as it is to have intelligent men in the purchasing department who know how to buy goods. Moreover, an employment department cannot be expected to pick good help unless it has some tools with which to work.

Work at Cross Purposes

Some years ago a foreman or a superintendent would ask for a man of a certain type or by a certain job classification. The employment department used a different classification; consequently, they were talking about two different things. It meant a lot of headaches. Today we have a complete description of every job in the plant. This description covers the duties of the job, the hours, the shift, the rate of pay, the amount of effort required, the amount of education and/or experience desirable, the general working conditions and the physical requirements of the job.

Not only the employment department but every departmental head has a copy of this material. When the department head requisitions a man—and we accept no verbal orders for help—he knows exactly what he is requisitioning, the employment department knows exactly what he wants, and as far as humanly possible he gets just that.

Two other practices have proved effective. First, we have established a school which is a miniature foundry. Ferro is a production shop, and a green man can hold up production and cut down the earnings of every man in his crew. Our school is, in fact, a miniature foundry line. We take an accepted applicant, put him to work in the school for a week or whatever may be necessary, and when he graduates he can take his place on the line to his benefit and the benefit of his fellow workers.

The other practice consists of meetings

held at intervals with the foremen. At these meetings our president discusses the company's problems, its future, orders on the books, and anything else which may tend to give them a better idea of our operations. Word passed on to the foremen quickly gets down to the employees and we benefit because the latter feel they have some idea of what is going on around the plant. We prefer to have the foremen get this information from the top rather than second-hand from the watchman or the elevator operator.

So much for getting the right man. Now let's see how we are going to keep him. Here we run into a series of problems, some of which are entirely outside our control.

For instance, wages. Very few of us set our wage scale independently of competing labor markets. We have to pay the going rate, either of other foundries or, if there are no other foundries, in other plants which do roughly comparable work. We can't get out of line and pay higher wages. Nor can we save money and pay lower wages and expect to get men—the kind of men we want.

So our wage rates are pretty clearly defined, either by other plants or by union contracts. The only reflection we get of wage rates is when a man tells us that he doesn't think he is paid enough for the kind of work he is doing. If that is the case, we just have to bid him goodby because we just can't go above the scale at which he was being paid.

Increase Pay Rate

However, there is one way to get around the standard wage rate; that is by increasing use of incentive or piecework bonuses. We are using this method widely and we find that in general it works. It certainly gives the ambitious employee who wants to make more money an opportunity to do just that.

While use of the piecework and incentive rate generally means that the wage problem is not so pronounced among our production workers, it is a source of trouble among the nonproductive workers. We shall have to lick that problem someday by tying the rate of the nonproductive worker to some standard of measurement. If we do that successfully, we should be able to reduce the number of indirect workers and keep them better satisfied.

The next factor that helps keep employees is the all-embracing one known as working conditions. Working conditions can be anything from a clean floor to good equipment. We have paid a lot of attention to working conditions the last three or four years in an honest effort to keep our plants as clean and pleasant as possible. This has included the installation of an air-conditioning system, which

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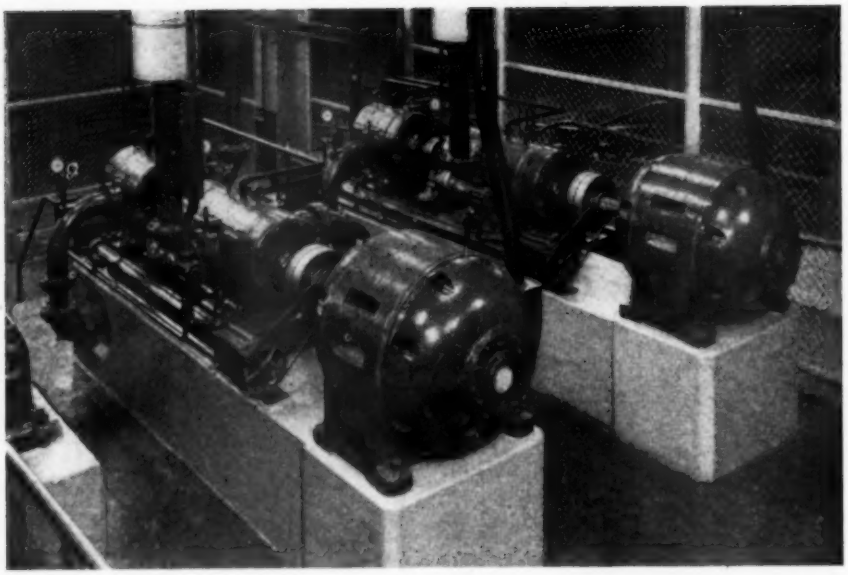

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has gone a long way toward eliminating dust and smoke. As a result the workers not only are more contented, but the elimination of smoke, dirt and dust, I believe, enables them to earn more money.

Now it is unlikely that all foundries can install ventilating and air-conditioning systems, but every operator can go through his plant and, with a critical eye, pick out certain bad spots which can be improved with relatively little expense or effort. The trouble with most of us is that we get so used to a set of conditions that we never visualize them as being any different. We say it has always been done this way, so we continue doing it that way. What we need is an inquiring mind which is constantly asking, "Can't we do this better?"

Some years ago a friend of mine interviewed a number of steelworkers who had been in the business for a quarter of a century and asked them what impressed them most as they compared the present-day steel industry with the steel industry of 25 years ago. He thought they would speak of the increased wages, decreased hours and other very apparent advances.

Take Pride in Appearance

Not a man mentioned either hours or wages. But they all agreed the one thing which impressed them most was the fact that when they got through working they could take a shower and change to street clothes. They took pride in the fact that when they left the plant they looked like other people. This may sound trivial, but it means a lot to the men to be able to take off their foundry clothes, get a shower, put on their street clothes and return home looking clean and neat. We had this in mind when we recently completed a large and attractive locker and shower room to augment older units.

The next point in keeping employees is that they will not be kept without good supervision. This is a large subject in itself, but I want to make this observation —that if every supervisor, whether he be a president or vice president, a superintendent or a foreman, would use the proper approach to a human being, we would find most of our human problems disappearing.

The trouble is, we've got a funny idea when we get to these human problems. If we are thinking or talking about machines, we become very analytical. We hold conferences and give a lot of thought to the subject. But we very rarely try to figure out for ourselves how we should treat our fellow worker and then put our best ideas into action.

I am convinced that most of the troubles we have are due almost entirely to the lack of tact and good ordinary common sense on the part of someone. Very simply, this relationship starts with the approach which one man has to another. The foreman who loses his head,

or forgets to use common everyday politeness in dealing with his men has caused more labor relations problems than many of us realize.

One more point fairly well sums up this matter of keeping workers. In looking over a situation, ask yourself honestly whether you would be contented and willing to work under the circumstances and conditions under which you are asking other men to work. If you will do that, you will find again there are improvements that can be made, which will help keep the men on the job.

We found a couple of years ago that the establishment of a convenient and large parking lot was a real asset. Before that our employees parked in the street and frequently had to walk as much as half a mile from their car to the plant. Good parking facilities help.

Recreational Programs Beneficial

We have also found that recreational programs, such as baseball and bowling, stimulate a friendly rivalry that is beneficial. This is particularly true in the case of the returned veteran who was encouraged to enter into recreational programs in the military service. He takes part in such activities wholeheartedly. Another thing which we have done recently, and which I believe will be of value, is the establishment of a plant publication that ties the men together and at the same time gives management an opportunity to explain its problems to the men in the plant.

Such a plant publication can be as simple as a mimeographed single-page letter from the president, or it can be a full-blown printed publication liberally illustrated. It can cost next to nothing, or it can be as expensive as one wishes to make it.

At the beginning of 1946, during the period of reconversion in the automobile industry which was considerably delayed by strikes, we had approximately 1200 people on our plant payroll. Today we have doubled that, or about 2400. Following the various employment and personnel procedures outlined here, we had very little difficulty building up our work force during the first seven or eight months of the year—this, in spite of shortages of pig iron and coke that harassed us from time to time and shut us down completely for one period of three weeks. We feel, therefore, that an aggressive and well rounded personnel program can get results even in these days which have been characterized as a state of permanent instability.

And while some of the measures suggested here admittedly lose part of their effectiveness under conditions such as prevail in the labor market today, they can prove helpful over the long term.

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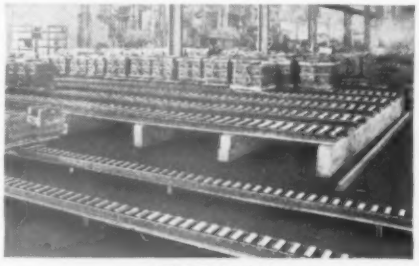

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Repair Welding Steel Castings

(*Continued from page 77*)

control if dependence were placed on the ability of foundrymen to establish and maintain a welding program based on sound metallurgical engineering analysis. Since caveat emptor practices have long been dead in American industry, purchasers of castings would be amply protected by a general requirement for a welding repair plan worked out by the individual foundries to meet their specific needs.

Most everyone realizes that the maximum hardness in a welded joint is found in the heat affected area just beyond the fusion zone. Hardness itself is not troublesome but the decreased ductility that accompanies higher hardness values is undesirable. Therefore hardness and ductility must be related. And this relationship has to be established for each steel, possibly for each heat of the same type of steel until the range of hardness-ductility balance is determined.

Before considering two specific analyses as examples, the factors leading to hardness in the heat affected zone of any individual steel warrants review. Of course, hardness is influenced by rate of cooling. In turn, the rate of cooling is a direct function of heat input and heat extraction. In metallic arc welding, heat input is governed by the welding current, the arc voltage and the speed of travel. Similarly, heat extraction is controlled by metal mass and temperature.

A common means of determining hardenability exists in the Jominy end quench specimen. For the purpose of measuring heat-affected zone hardenability, Jominy specimens are heated at 2100 F for 30 minutes and quenched in the customary manner. Vickers hardness numbers for three specimens are averaged.

When the Jominy end quench specimens are tested, a curve such as Fig. 5 may be drawn to show hardness as a function of distance from the quenched end in 1/16-in. A sharp decrease in hardness, such as exhibited by SAE 1035, suggests good weldability. SAE 2330, which maintains its hardness and has deep hardenability, would be expected to give more trouble in welding. And it does.

But ductility, not hardness, is the criterion to use. Using the same steel, notched specimens with a ⅛-in. radius of notch are bent slowly after heat treating to establish various hardness levels. This procedure gives the data on which

the curves in Fig. 3 are founded. Notice that at the same ductility, SAE 2330 is always harder than SAE 1035. This condition further emphasizes ductility as a proper index to weldability.

Two typical steels, SAE 1035 and SAE 2330, will be used to analyze those welding conditions essential to the establishment of a good welding procedure. Analyses of these steels are listed in Table II. One of these steels has relatively high carbon while the other is a nickel alloy. Actually these are wrought steels but the method can be used for cast steels also. It is well known that wrought and cast steels of the same composition are equally weldable.

Using the two steels, SAE 1035 and SAE 2330, with the analyses reported in Table II an attempt will be made to establish a satisfactory welding procedure. It will be assumed that a repair is being made in SAE 1035 steel as welded while the SAE 2330 steel is to be stress-relieved after welding. With the SAE 1035 steel an as-welded bend angle of 20° corresponds to a maximum hardness of 235 vhn. No lime-ferritic electrodes will be used with the SAE 1035 steel, thus making the establishment of the welding procedure more difficult.

The SAE 2330 steel will have a stress-relieved bend angle of 10° corresponding to a maximum vhn of 390 for ordinary electrodes or a bend angle of 6° with a hardness of 500 vhn maximum for lime-ferritic electrodes. Now the five major influencing factors can be evaluated.

Heat Input—

Welding current: Suppose a bead is deposited on a flat surface of ½-in. steel. How is the hardness affected by heat input? The influence is shown in Table III. In the limits of this example a 3/16-in. electrode of the types other than lime-ferritic produces in both steels a heat-affected zone that is too hard, while increasing to a ¼-in. diameter results in a satisfactory condition.

Arc voltage: What happens when the arc voltage changes?

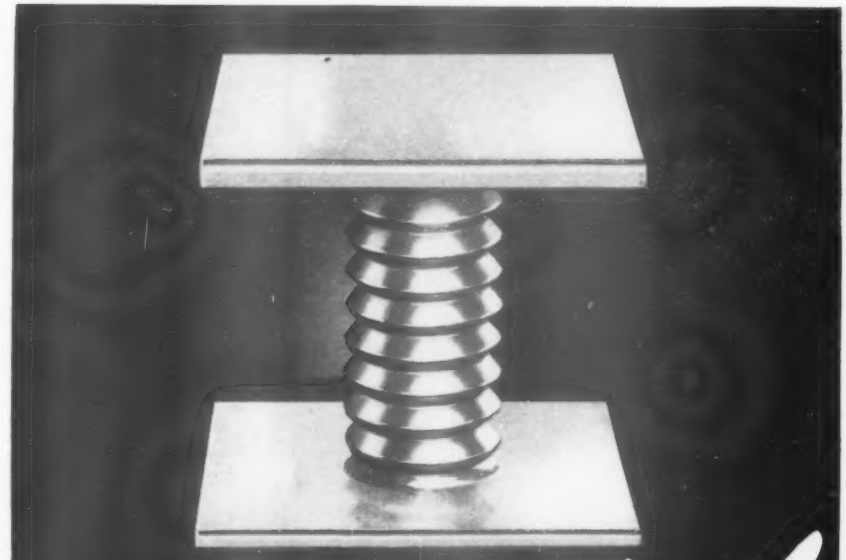
Lowering the arc voltage with the same current reduces the power input. Once more the common electrode types are eliminated while the lime-ferritic variety proves acceptable. Results of voltage variation are indicated in Table IV.

Travel speed: The selected travel speed of 6 in. per min. suggests that the electrode is being weaved. What happens if a stringer bead is run at 12 in. per min.? Effect of varying travel speeds is shown in Table V.

Heat Extraction—

Mass: Suppose the bead was run on 2 in. instead of ½-in. steel. What then?

(*Continued on page* 206)



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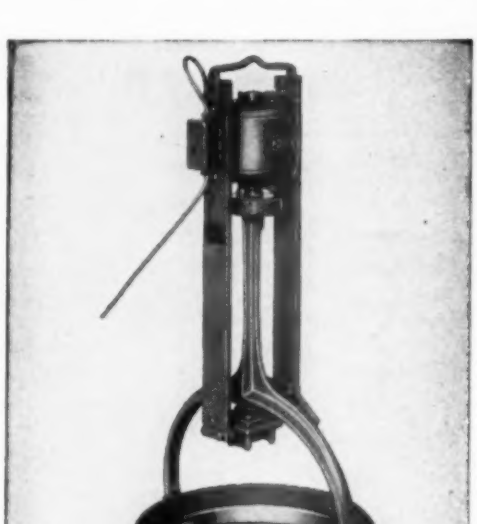

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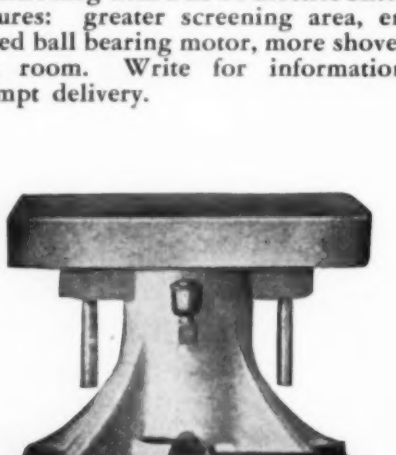

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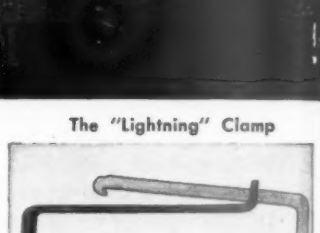

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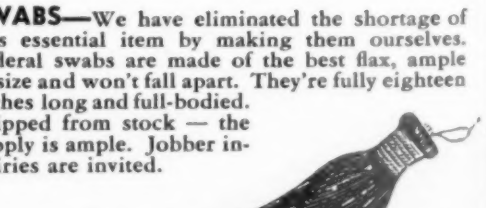

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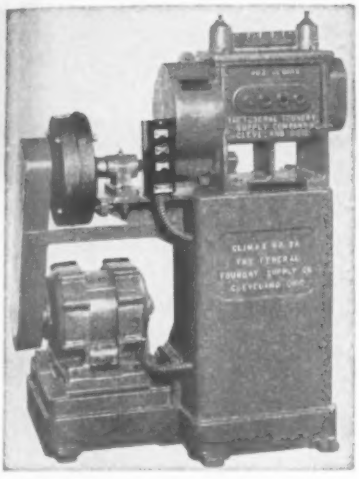

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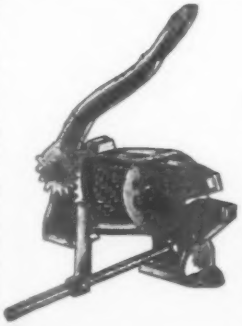

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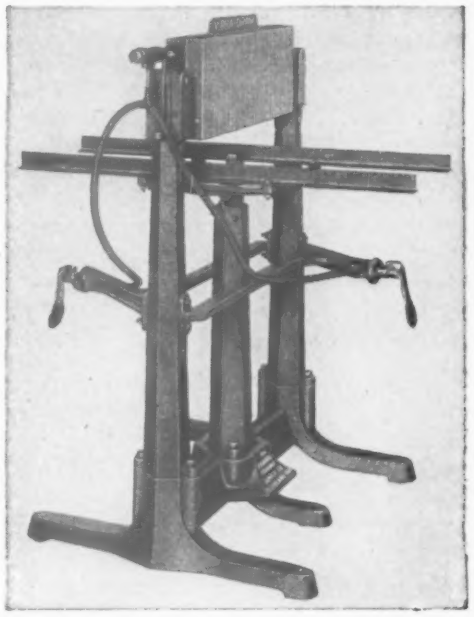

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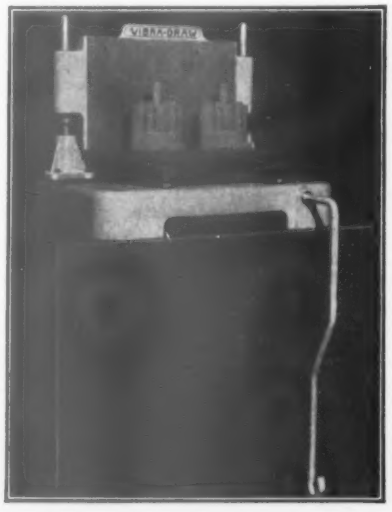

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(*Continued from page* 203)

Role of mass in affecting hardness is detailed in Table VI.

Temperature of the steel: Suppose the casting was welded at 32 F, 75 F or 400 F. What happens? Table VII illustrates decreasing hardness values.

Fixed conditions: Still another study should be made of these factors. This time the SAE 1035 steel only will be considered. Standard welding conditions will be established around a ¼-in. E6020 electrode, welding at 350 amperes and 35 volts, with a temperature of 75 F, a travel speed of 6 in. per min, a single bead on a ½-in. plate. The weld will not be stress-relieved, so a 20° bend angle or a maximum vhn of 235 is indicated. Because this work is aimed at establishing a welding procedure, the *Guide to Weldability* will be used again.

TABLE VIII—Effect of Electrode Diameter on Weldability

Diam.	Amp.	Volts	Hardness, VHN	Remarks
1/8″	125	27	297	Too hard
5/32″	185	28	258	Too hard
3/16″	230	29	250	Too hard
7/32″	280	31	242	Too hard
1/4″	350	35	232	OK
5/16″	400	38	<181	OK
3/8″	450	40	<181	OK

TABLE IX—Influence of Travel Speed on Heat-affected Zone Hardness

Travel Speed in./min.	Hardness VHN	Remarks
18	275	Too hard
12	252	Too hard
10	248	Too hard
8	241	Too hard
6	232	OK
4	<181	OK
3	<181	OK
2	<181	OK

What is the effect of electrode size throughout the entire range that might be used for casting repair? These data are given in Table VIII where average current and voltage conditions have been selected. The lowest hardness reported in the Guide is vhn 181 for SAE 1035 steel, explaining why lower hardnesses are not given here.

Arc voltage will not be studied further because welding technique establishes the arc voltage within comparatively narrow limits. The variation shown in Table IV was a gross exaggeration to point out the place of arc voltage in arriving at a procedure for welding. In practice a voltage spread as great as reported in Table IV would never be encountered.

Travel speeds do differ with the width of the welding groove. If, in a wide groove, the electrode is oscillated from side to side, the travel speed is slow. A narrow, confining groove, on the other hand, automatically necessitates a fast rate of travel. Two notes of caution are indicated at this point. First, most electrodes should not be oscillated more than four times the diameter of the core wire because porosity may become excessive. Second, narrow grooves prevent the welder from manipulating his electrode properly and may lead to slag entrapment. In Table IX, the full range of travel speeds will be investigated, remembering that many factors remain fixed as indicated in the paragraph on the basic premises for this portion of the discussion sub-headed *Fixed conditions*. Of course, practical travel speeds to be found in the welding of castings probably fall between 4 and 12 in. per min.

The question of mass logically suggests type of repair groove as well as metal thickness. Therefore, groove design will be evaluated, as shown in Table X, in the following groups: (1) Bead on a casting or the last pass of a butt weld; (2) First pass in a vee or U groove; (3) First pass of a fillet weld; and (4) First pass in a vee weld with a backing strip.

Using the last pass of a groove weld for the joint design, the effect of parent metal thickness from 2 in. down to ⅛-in. can be reviewed with respect to weldability, as shown in Table XI.

And finally the problem of temperature will be analyzed. Results are listed in Table XII. These data show that temperature has little deleterious effect on the heat-affected zone of SAE 1035 steel.

Fig. 7 summarizes the data presented in Tables VIII to XII, inclusive. Under the conditions adopted the joint design has a marked effect on hardness. Fortunately, fillet welds are not too common in casting repairs. The electrode diameter produced the second hardest weld but again ⅛-in. electrodes are not popular in foundry welding. Metal thickness is next and important in the repair of heavy castings. Travel speed merits some thought. And interpass temperature becomes a minor influence in this case.

Using the *Guide to Weldability* an exploration of the factors involved in keeping heat-affected zone hardnesses within bounds has been undertaken. If the assumptions are correct, and practice suggests they are, a simple and inexpensive approach to weldability becomes available. Certainly the cost of a few Jominy bars and bend specimens is less than that involved in welding dozens of test plates.

An anticipated question is the reason for adopting 12° as-welded and 6° stress-relieved bend values for lime-ferritic electrodes instead of the 20° and 10°, respectively, recommended for all other electrode types. Two metallurgical considerations are involved. One is the formation of martensite upon cooling, and the other is the cracking of the heat-affected zone by hydrogen shattering. Work completed during the war revealed underbead cracking of hardenable steels with all electrode types except the lime-ferritic. The difference in parent metal response as measured by cracking was attributed to the atmospheres created by the electrode coatings. Thus the ordinary coatings produced a high-hydrogen content in the welding atmosphere while the lime-ferritic coatings formed an almost hydrogen-free atmosphere.

The hydrogen was believed to dissolve in the weld metal, to diffuse to the heat-affected zone, and to develop cracks there on cooling. Therefore it seems reasonable to expect a bonus in the form of lower ductility requirements when lime-ferritic electrodes are used on hardenable steels. The values of 12° and 6° were selected for austenitic stainless steel welds in very hardenable steels by the men who worked on the Guide Book method. Field applications on high carbon and low alloy steels find the lime-ferritic electrodes employed successfully on joints hitherto weldable with the austenitic stainless steels alone.

But weldability is not confined exclusively to the heat-affected zone of the casting. Since the medium carbon and low alloy cast steels have been designed for heat treating to bring out the best combination of physical properties, the weld metal must match the properties of the parent metal.

TABLE X—Groove Design Effect on Weldability

Groove Design	Hardness VHN	Remarks
Bead on casting or last pass groove	232	OK
First pass vee or U grooves	230	OK
First pass fillet weld	310	Too hard
First pass vee weld with backing strip	236	Too hard

TABLE XI—Mass Influence on Heat-affected Zone Hardness

Metal Thickness	Hardness VHN	Remarks
2″	285	Too hard
1-1/2″	270	Too hard
1-1/4″	260	Too hard
1″	251	Too hard
3/4″	246	Too hard
5/8″	240	Too hard
1/2″	232	OK
3/8″	<181	OK
1/4″	<181	OK
1/8″	<181	OK

TABLE XII—Interpass Temperature Effect on Weldability

Interpass Temp., °F.	Hardness VHN	Remarks
32	235	OK
75	232	OK
200	230	OK
300	<181	OK
400	<181	OK

Fig. 6 presents the details of a commonly used test plate which may be cast by the foundry. By making tests of parent metal, weld metal and fusion zone, as suggested by the drawing, good

(*Continued on page* 208)

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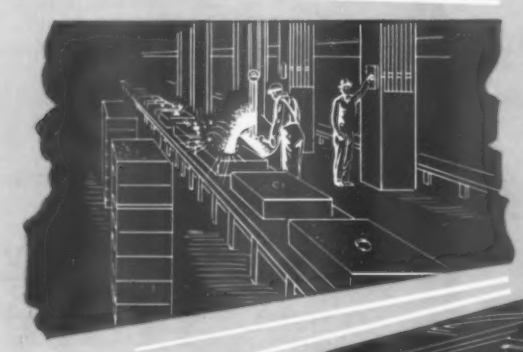

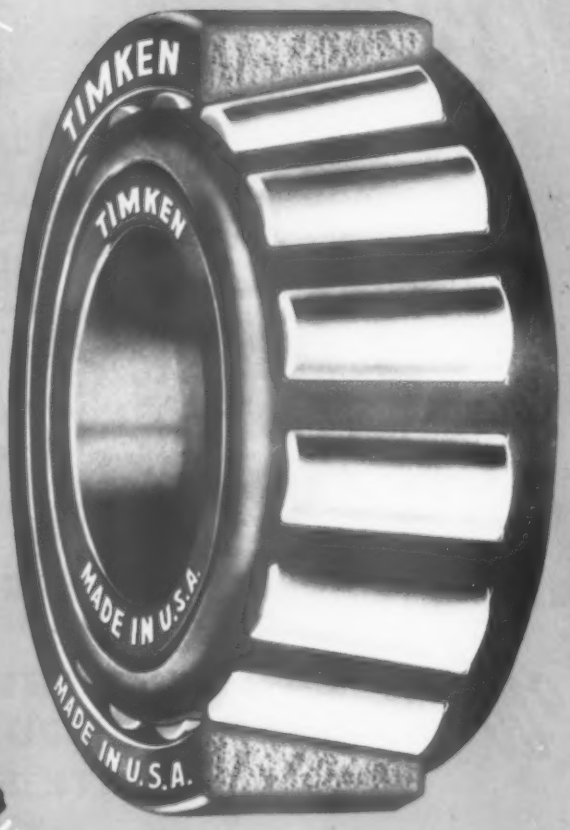

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(*Continued from page* 206)

metallurgical evaluation of welded casting repairs becomes possible. Typical results of one application are reported in Table XIII for specimens *B* and *C*. of Fig. 6. Two electrodes were used in an effort to match the properties of the casting both as welded for minor repairs and heat treated after major repairs. Alloy additions have been made to the weld deposits to increase strength values. As usual, the yield point of the weld metal is higher than that of the casting.

Using unalloyed weld metal, the same casting was welded, with the results shown in Table XIV. Note the lower elongation for transverse tests. The

TABLE XIII—Properties of Weld and Cast Steel After Repair Welding

CHEMISTRY

	Cast Steel	Electrode A	Electrode B
C	.25	.10	.12
Mn	.72	.52	.68
P	.010	.017	.019
S	.026	.031	.030
Si	.42	.22	.22
Cr			.90
Mo		.40	.45

MECHANICAL PROPERTIES

	Cast Steel	Electrode A	Electrode B
Condition	Heat Treated	As Welded	Heat Treated
Yield Point, psi	46,500	63,000	51,500
Tens. Strength, psi	76,700	73,400	76,000
Elong., % in 2"	21.5	25.5	31.0
Reduc. of Area, %	31.5	45.5	64.6

HEAT TREATMENT*

	Cast Steel	Electrode A	Electrode B
Normalize at °F.	1650	None	1650
Hold, hours	2	....	2
Cool in	Air	....	Air
Temper at °F	....	....	1150
Hold, hours	....	....	2
Cool in	....	....	Air

* All castings normalized prior to welding.

greater strength of the parent metal causes most of the elongation in the weld metal in a shorter gage length. The equal reduction of area suggests an equivalent ductility for the weld metal.

All-position welds are being made in the repair of nickel steel castings with the results tabulated in Table XV. This was a vertical weld stress relieved for four hours at 1150 F. All data on welds reported in Tables XIII, XIV and XV are for lime-ferritic weld deposits. In every case, x-ray sound metal was achieved.

Heretofore two electrode types have predominated in the repair of medium carbon and alloy steel castings. For all-position work where welds had to be made in the vertical and overhead positions, E7010 electrodes conforming to AWS-ASTM specification A233-45T predominated. Welding speeds were necessarily slow while exographs revealed some porosity in the welds. Usually the porosity was within acceptable limits but not always.

(*Concluded on page* 210)

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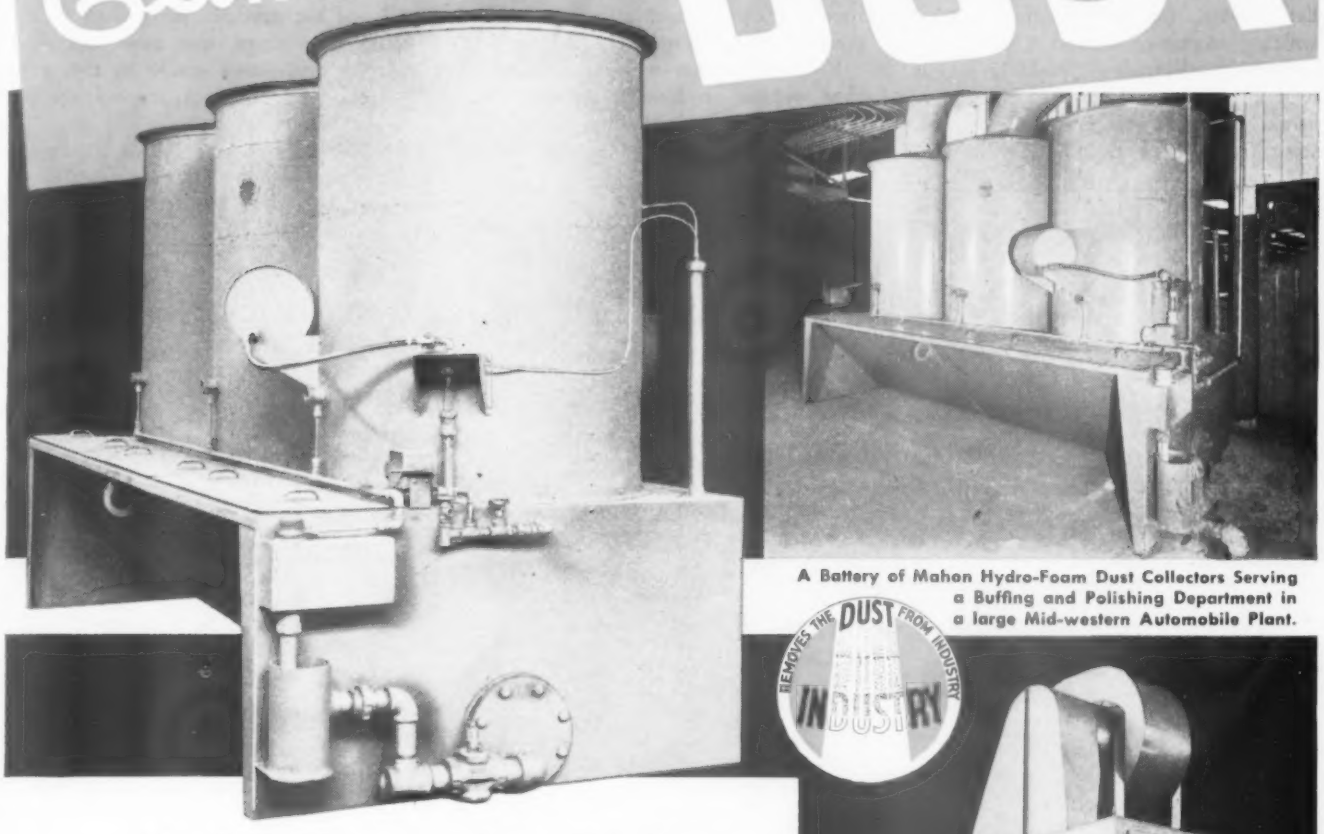

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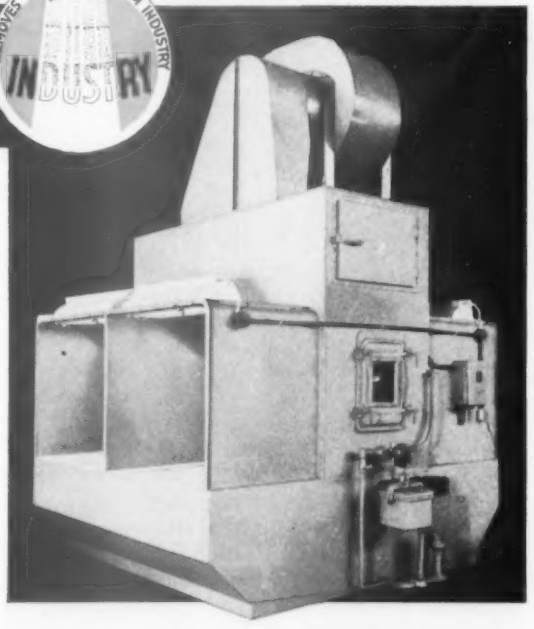

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TABLE XIV—Comparison of Longitudinal and Transverse Weld Properties

	As Welded		Heat Treated	
	Longitudinal (Specimen C)	Transverse (Specimen D)	Longitudinal (Specimen C)	Transverse (Specimen D)
Yield Point, psi	58,000	53,000	43,000	48,000
Tensile Strength, psi	65,900	65,800	58,000	58,500
Elongation, % in 2"	35.0	24.5	39.0	26.0
Reduction of Area, %	75.8	74.3	73.8	75.3

(*Concluded from page 208*)

Where repairs could be made in the flat position, foundry metallurgists and welding engineers showed a preference for E7020 electrodes. Welding speeds were high and exographs of completely sound weld metal were commonplace. Both the E7010 and the E7020 electrodes required high preheating temperatures to assure crack-free heat affected zones as carbon and alloy contents of the castings increased.

Now all-position welding and downhand welding are being done with lime-ferritic electrodes. Welding speeds are good, spatter loss is extremely low and x-ray soundness is excellent. Furthermore, a wide variety of alloy compositions bring weld metal physical properties in line with those of the castings. Low hydrogen atmospheres insure the heat-affected zone against hydrogen fissures. Lime-ferritic electrodes produce the best physical properties of any coating type. Impact strengths and ductilities are unusually good. Aging properties and hot strength, particularly in the blue-brittle range, are most desirable, thereby minimizing cracks in the weld metal where shrinkage stresses are severe.

Modern founding practices are bringing steel castings to a new position of remarkably good properties. It is indeed fortunate that the welding electrodes available for casting repairs have kept pace with the improvements in cast steels.

The author wishes to express his appreciation to G. A. Lillieqvist, director of research, American Steel Foundries, for reviewing this manuscript before publication.

TABLE XV—Welds in Nickel Steel Castings

	Casting	Weld Metal
C	0.25	0.09
Mn	0.80	0.80
P	...	0.019
S	...	0.018
Si		0.18
Ni	2.25	2.09
Mo		0.45
Yield Point, psi	48,000 Min.	78,000
Tens. Strength, psi	75,000 Min.	84,500
Elong., % in 2"	24.0 Min.	26.0
Reduc. of Area, %	50.0 Min.	67.0

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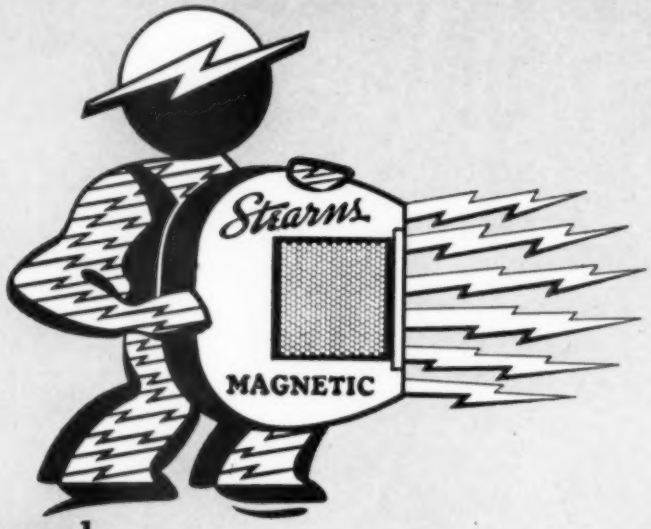
Book Review

English-French and French-English Technical Dictionary, by Francis Cusset, cloth, 590 pages, 5¼ x 6¾ in., published by Chemical Publishing Co. Inc., Brooklyn, N. Y. Price $5.

The English equivalent of French technical expressions and vice versa in the fields of metallurgy, mining, electricity, chemistry, mechanics and sciences, as well as conversion tables for the English and metric measuring customs, are given in this dictionary.



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RESINOUS SEALANTS FOR CASTINGS

(*Continued from page 87*)

it can penetrate readily into small voids. It also should be reasonably stable during storage in the liquid state. In curing it should form a resilient, adherent solid unaffected by moderately high temperatures and reasonably inert when exposed to hot oil, gasoline, water and other common solvents.

Of the materials mentioned some are satisfactory as sealants in certain applications but none of them can be regarded as a universal sealant. Because of the many recent developments in the field of plastics, it was considered desirable to investigate the effectiveness and durability as sealants of a number of available liquid synthetic resins. The present investigation was limited to this class of materials. Experiments were made to establish the sealing efficiency of several different resins, and durability tests were conducted on specimens treated with the most efficient sealants.

Materials and Apparatus—The porous specimens used in this investigation were bushings, 2 in. in outside diam and 2 in. long with a wall thickness of ⅛-in. Some were cast to size and machined on the ends only. Others were cast oversize and machined inside and outside to dimensions. The materials were commercial aluminum, an alloy of copper and 3½ per cent silicon, and red brass (85 per cent copper and 5 per cent each of lead, tin, and zinc). Some of the specimens had been prepared previously for another investigation; others were cast especially for this work, with the melting and casting conditions controlled to favor the development of the desired amount of porosity.

For the aluminum specimens this involved heating the metal to about 1600 F (250 F above the normal maximum heating temperature) which tends to develop a coarse structure and also favors gas absorption. In casting the copper alloy specimens, some of the mold surfaces were moistened with kerosene to insure the development of porous castings.

The degree of porosity in each specimen was determined by a hydrostatic pressure test. Some specimens showed considerable leakage at pressures as low as 25 psi and water was emitted as a steady spray when the pressure was increased to 100 psi. Others showed only slight signs of leakage at 600 psi. Specimens that could withstand a pressure of 600 psi for 5 minutes without leaking were considered sound and this criterion was adopted as a basis for judging the success of the sealing treatments.

Due to Microshrinkage

Examination of sections of porous specimens showed that most of the porosity was due to microshrinkage and consisted of cavities along the grain boundaries. This is illustrated by the micrograph of a polished section of a specimen of copper-silicon alloy, shown in Fig. 1. The maximum width of cavity observed in any specimen was about 0.002 in., but most of the cavities were much smaller.

The impregnating chamber shown in Fig. 3 was constructed for impregnation of the specimens by the vacuum-pressure method. The chamber consisted of a 12-in. length of 8-in. pipe, closed at one end and provided with a flange at the top end. The top was closed with a ½-in. steel cover plate fitted with a rubber gasket and held in place by bolts. Air and vacuum connections were welded into the side of the vessel near the top and a connection for admitting the resin was located near the bottom. Each of these connections was controlled with a valve and a drainage hole in the bottom was closed with a pipe plug.

The impregnating chamber permitted

(*Continued on page 214*)

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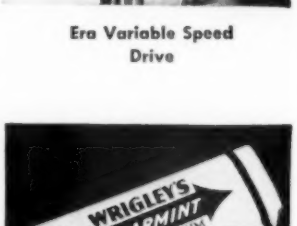

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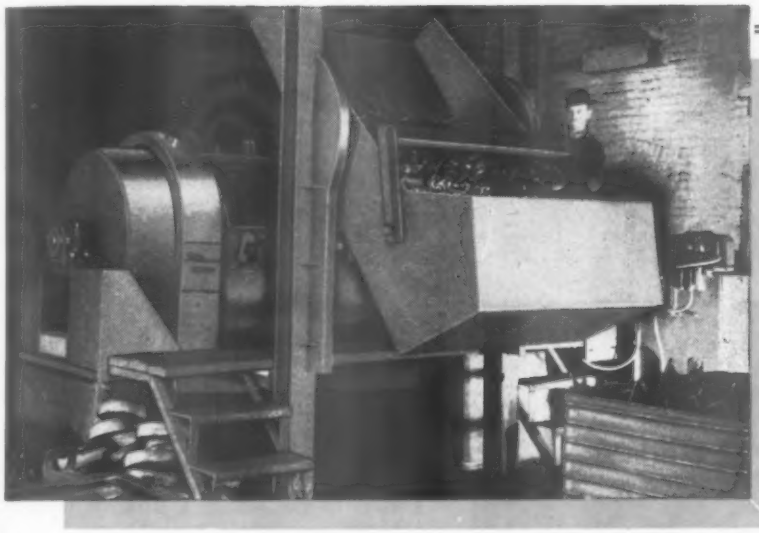

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(*Continued from page 212*)

treatment of ten specimens at one time with about ½-gallon of resin. The ten specimens used for each test were selected so that specimens of reasonably comparable porosity were treated with each resin. The procedure consisted in placing the cleaned and dried specimens in the chamber, closing all openings except the one to the vacuum pump, and evacuating to a vacuum of 28 or 29 in. for 2 hr. Then sealant was drawn in to cover the specimens and an air pressure of 75 psi applied for 1 hr.

After the pressure was released, the sealant was withdrawn and the specimens were allowed to drain. Most of the adhering resin was removed by wiping. A rinse in a suitable solvent, followed by wiping with a clean rag, removed the last of the sealant from the surfaces. The specimens were then cured under conditions recommended for each particular resin by the manufacturer. The curing schedules ranged from 1 hr at about 200 F to 4 hr at 275 to 350 F. In the case of many of the resins some exudation occurred during curing but the exuded material was removed before making pressure tests. The exudation that occurred during the curing of a porous aluminum specimen impregnated with a phenolic resin is shown in Fig. 2.

Fourteen resins were selected for investigation, representing commercially available products. Six of these have been recommended specifically as sealants; the others were selected for comparison with the commercial sealants. A low viscosity is an important requisite for sealants to insure penetration, but it is questionable whether or not this property should be gained at the expense of the solids content of a resin through dilution with volatile solvents.

For most of the resins the desired viscosities were obtained by using suitable amounts of the more fluid reactants like styrene in the co-polymerizing resins; a few of the resins required dilution with solvents, but these additions were not made on the basis of equal fluidities. One resin (No. 3) contained no added solvent and the viscosity of this sealant was somewhat higher than for the others.

Results of Impregnation Tests—Results of the sealing treatments with the various resins as indicated by pressure tests are shown in Table IV. In this and in other tables, the sealants are arranged according to arbitrarily assigned numbers with the type of resin indicated. For some of the resins, data are given to show the effect of a second treatment on the specimens that had not been completely sealed in the initial treatment.

Only four of the resins successfully sealed 46 per cent or more of the specimens in one treatment. One of these, No. 3 showed a sealing efficiency of 46 per cent in the initial treatment but indicated no improvement in the second treatment. Resin No. 5 sealed 50 per cent of the test specimens in one treatment but the curing of this resin was catalysed by contact with copper even at room temperature, and the bronze specimens became coated with a solid material during impregnation which was exceedingly difficult to remove.

Two of the sealants (No. 13 and No. 14) made the best showing. No. 13 is a phenolic resin in alcohol solution and is recommended by the manufacturer for eliminating leakage in all types of metals and alloys. No. 14 is a styrene-polyester resin developed particularly for sealing aluminum and magnesium castings. In the initial treatment No. 13 sealed 58 per cent of the specimens tested and No. 14 sealed 47 per cent. After two treatments the total percentages sealed were 79 per cent and 86 per cent, respectively, for the two resins.

Since these two resins were the only ones that yielded reasonably satisfactory results in the sealing treatments, durability tests were confined to specimens repaired with these sealants.

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Durabiilty Tests on Sealed Specimens—Repaired castings must withstand exposure to service conditions in addition to being pressure tight immediately after the impregnation treatment. Thus it is important to know how the sealing material will withstand exposure to hot motor oil, high octane gasoline, or boiling water over extended periods. Likewise a knowledge of the effect of elevated temperatures or of hydraulic pressures in excess of 600 psi, may be of importance in some applications. Another factor deserving consideration is the ability of the sealed casting to withstand thermal shock.

In order to evaluate the durability of the seal produced by the two most efficient sealants, a number of experiments were conducted. In most of these tests five specimens sealed with each resin were exposed simultaneously under each condition and the durability was judged by pressure tests on the specimens, either at regular intervals or upon completion of the exposure test.

1. Exposure to liquids—Effects of exposure to motor oil at 250 F, high octane gasoline (AN-F-28 fighter fuel) at room temperature, and boiling water were determined by completely immersing sealed specimens in each medium. The exposure tests were continued for 16 weeks, the specimens being removed for pressure tests at intervals of 4 weeks. Sound specimens were replaced for further exposure after each pressure test. The results of these tests are given in Table III.

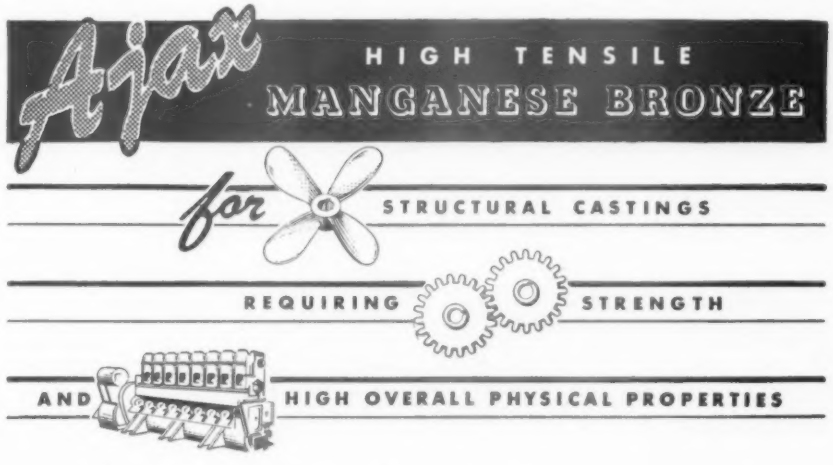
2. Effect of elevated temperatures—The stability of the two sealants at elevated temperatures was determined by exposing sealed specimens in air at a specified temperature for 5 hours, pressure testing the specimens, and then exposing the pressure-tight specimens at a higher temperature. This procedure was continued until all of the specimens had failed. The first exposure was at 400 F and the temperature was increased by 100 F in each successive cycle. The results of tests are given in Table I.

3. Effect of testing at pressures in excess of 600 psi—Another group of castings was tested to determine the maximum pressures that the sealed specimens could withstand. The specimens were first subjected to a hydrostatic pressure of 700 psi for 5 minutes. Those specimens which were sound at this pressure were then tested at 800 psi. The pressures were thus increased by increments of 100 to 200 psi until leaks developed in all of the specimens. The results of these tests are shown in Table II.

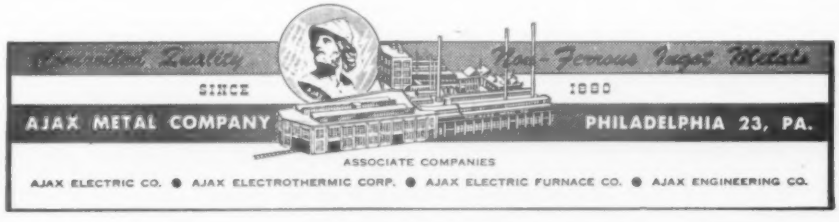
4. Effect of thermal shock and aging—Ability of the sealed castings to withstand thermal shock was determined by alternately immersing the specimens in baths at 212 and 32 F, respectively. The castings were kept in each bath until they attained the temperature of the medium. After 25 cycles (50 changes of temperature) the specimens were tested for pressure tightness. Four of the five specimens treated with resin No. 13 had developed leaks, whereas only one of the five specimens sealed with resin No. 14 had failed.

Five specimens sealed with each resin were retested for pressure tightness after storage at room temperature for 6 months. No change had occurred in any of the specimens during this period.

Conclusions—Of fourteen resins tested to determine their efficiency as sealants for porous castings, only two showed promise in this respect. Even these two resins sealed only 50 per cent of the specimens subjected to one treatment but a second impregnation increased the sealing efficiency to about 80 per cent. As a double treatment does not insure complete sealing, it is necessary to test all castings to identify those which have not been sealed. This undesirable feature necessarily limits the value of the process, and for that reason the use of sealants, except in some special appli-



Designers and foundrymen, charged with the gigantic responsibility of specifying engineering materials for the products of a world once again at peace, are closely scrutinizing the widest range of selectable materials ever offered to industry. Of primary importance is the direct consideration of Performance; and, decisions thus made must, of necessity today, be tempered with new emphasis on total Cost. An alloy, therefore, which measures high in strength, toughness and corrosion resistance—which has cut its eye-teeth long ago on marine castings and fittings, engine bases, pump bodies, gears, etc.—yet permits the foundryman to produce solid castings perfectly free from surface imperfections and which leave the sand bright and clean—and will take a mirror-like polish —an alloy like that deserves investigation. A metal of such calibre is Ajax High Tensile Manganese Bronze. Produced under rigid laboratory standards to constant formulae, this Ajax ingot has established recognition as the highest quality manganese bronze available. Write for complete data NOW.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cations, probably will be resorted to only in emergencies.

Regardless of the circumstances requiring the use of a given sealant, its durability under service conditions should be given first consideration. The results of the tests indicated that a resin may be decidedly superior for one type of exposure but may be of questionable value under other service conditions. Thus the styrene-polyester resin (No. 14) was considerably more satisfactory than the phenolic resin (No. 13) in exposure to petroleum products (Table III), while the phenolic resin was superior for use under elevated temperature conditions.

In addition, the phenolic resin required the application of higher pressures to produce failure at room temperatures. Both resins were reasonably stable in exposure to boiling water. Under thermal shock conditions the polyester resin (No. 14) was decidedly superior. Undoubtedly this is due to the fact that the latter forms a resilient material upon curing whereas the phenol formaldehyde resin is converted into a glassy, brittle mass that fractures readily as the casting expands and contracts.

Although impregnation with sealants now available may be a useful method for rendering certain types of porous castings pressure tight for limited service conditions, the results of this investigation suggest that, in general, the production of leak-proof castings remains essentially a foundry problem. Thus the development of pressure-tightness in castings, in general, will result from careful design, judicious selection of alloys and the application of good foundry practice. It is better to avoid the formation of porosity than to try to remedy it.

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10. "Sealants for Metal Castings for Varying Degrees of Porosity," by R. W. Crawford and S. E. Glick, *Product Engineering*, Vol. 16, page 53 (1945)
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They RESIST WARPAGE

. . . it's less than 0.1%

Transite Core Plates offer all these advantages:

They speed production

Core makers save trips... handle many plates at one time.

They last longer

Made of fibrous asbestos and cement, Transite Core Plates resist shock...are less likely to crack or break.

They clean easily

Core wash, sand, etc., do not stick as readily as to other materials. Both sides are usable.

They resist corrosion and warpage

Transite Core Plate surfaces stay smooth even after long service. Warpage is less than 0.1%.

They are economical

Low price, low maintenance and long life add up to low cost.

To eliminate green cores and reduce baking time perforated plates are also available.

For full details write Johns-Manville, Box 290 New York 16, N. Y.

Johns-Manville

TRANSITE CORE PLATES MADE OF ASBESTOS

PATTERN SHOP AND NATIONAL ECONOMY

(*Continued from page* 79)

battle of the giants. Along the battlefront we find industry against industry. The individual company is as powerless as is the individual soldier in modern warfare! Let us consider just a few instances so that we may more clearly grasp the situation confronting us.

Not so many years ago the ice manufacturer was confronted with the prospect of mechanical refrigeration taking his markets. At that time 2000 ice producers met. They were worried and anxious. Before each one, in letters a mile high, shrieked the announcement that one million electric refrigerators would be put in the homes of the land that year. A billion-dollar industry wondered as to the future. Here was competition stark and brutal threatening the theory that only ice could cool.

Someone suggested that they might sell ice instead of peddling it. He pictured 20 million families owning automobiles, 16 million using telephones, and only 12 million using ice boxes. A

(*Continued on page* 218)

IRONTON CARO-LINE

THE MONOLITHIC LINING FOR MALLEABLE IRON LADLES

"Ironton Caro-Line" Siliceous Ramming Refractory is giving exceptionally good service in ladles handling malleable iron. Some of the largest malleable plants in this country and Canada are using it regularly. Its high refractoriness and great resistance to metallic oxides, gives cleaner iron and reduces loss of castings due to slag inclusions.

It is easy to install and your operators will like it. Ask us for complete information on "Ironton Caro-Line".

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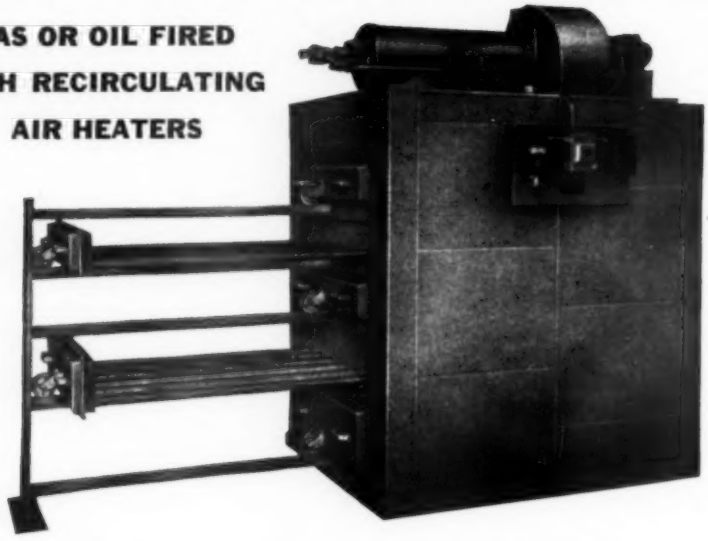
THE IRONTON FIRE BRICK COMPANY

RELIABLE REFRACTORIES

IRONTON OHIO

PORBECK DRAWER TYPE OVENS

GAS OR OIL FIRED
WITH RECIRCULATING
AIR HEATERS



UNIFORM CORES CONTINUOUSLY WITH LOW COST OPERATION

Strictly a *production* unit—note that all drawers operate independently of each other. Comes completely equipped with latest type temperature indicating controls (variable 100° to 650° F) and high efficiency recirculating air heater. Sturdy construction with 4-1/2" fibre-glass insulation throughout. Users commend Porbeck ovens for their space and time saving features. Available in several types and sizes. We invite your inquiry.

WRITE FOR NEW CORE OVEN BULLETIN "F"

PORBECK MANUFACTURING CO.

Manufacturers since 1894 of Core Ovens, Mold Dryers, Processing Ovens, Mold Drying Ovens, Heat Treating Ovens, and Paint Baking Ovens.

2600 N. Ninth St. **St. Louis 6, Missouri**

Alnor **PYRO LANCE**

built for foundry service

The rugged, shock resisting pyrometer movement and the enclosed extension thermocouple make a unit especially designed for foundry service. It is easy to secure the quick, accurate temperature readings which are so important in the efficient production of sound castings.

The Alnor Pyro Lance is especially designed for use with molten brass, bronze, copper, aluminum and magnesium alloys and similar metals where temperatures are not over 2300° F. With its enclosed thermocouple the Pyro Lance takes true temperatures below the surface, unaffected by dross or surface conditions. Write for descriptive bulletin.

ILLINOIS TESTING LABORATORIES, INC.

420 NORTH LA SALLE STREET
CHICAGO 10, ILLINOIS

(*Continued from page* 216)

fund was raised for market research and promotion. Millions of pamphlets were distributed about the proper care of food. The ice man suddenly became courteous—he no longer left a trail of water on the kitchen floor.

A giant industry awoke. Trade association leaders restrained hot-heads from foolish comparisons—"those new-fangled contraptions explode; they wilt lettuce; are not fool-proof; always need a mechanic." Instead, the industry sold ice and did not unsell refrigeration.

Result? The 12 months following, despite a cooler summer, showed a 7 per cent increase in sales of ice. But there was something more significant than material benefits. At that time the president of our largest ice company, announcing that the past nine months had been the best period in its history, added:

"When the electric people arrived, we got busy; we cleaned house, we cut out the dead wood and the lazy unprogressive personnel. We worked out our distribution more effectively and we added more customers constantly."

There is more to this story of ice that the president of this large ice company did not mention—that is, the fact that their profits increased beyond their own expectations.

Brings New Problems

Many other examples could be given of what those in a given industry have done to retrieve lost markets and prestige. Let us take our own situation and the castings industry. The new order confronting us in the days ahead and instigated largely by the most devastating war in history brings new problems. In the foundry industry increased facilities have been created for the production of both ferrous and nonferrous castings. Among competing industries there is a large capacity for producing forgings and a sizable increase in facilities for making various types of rolled steel. Many plastics are being offered.

Wartime government training of feather duster apprentices which made Winnie a welder in two months has given a lot of good publicity to the welding process. Incidentally, for many years in advance of the last war period, the welding people have been doing an outstanding job in selling their form of fabrication.

It is important for the reasons just mentioned that the foundry industry and those affiliated with it take steps to impress upon the public the advantages of castings use. The pattern industry is dependent upon the fortunes of castings for its future markets, and it is important that the industry look at the pic-

(*Continued on page* 220)

KORGLAZE

Completely

SMOOTH CORES

The illustration shown here suggests clearly how KORGLAZE works. One half of the core used in this casting was treated with KORGLAZE; the other half was untreated. The metal that lay against the KORGLAZED surface is smooth and clean; the metal that lay against the untreated surface is rough, lumpy ragged. Tests like this bring up startling contrasts, and demonstrate beyond doubt that KORGLAZE, by giving smoother cores, gives SMOOTHER CASTINGS. KORGLAZE is mixed with graphite, and the two products are stirred together cold. Cores may be dipped or sprayed, and treated hot or cold. Yes, you can make castings smooth as silk—KORGLAZE will do it for you. May we send you a sample?

LINBOND · KORBOND · AQUA-BOND · AQUA-SET · KORGLAZE · TOP-BOND

United Oil Mfg. Co.

1429 WALNUT ST., ERIE, PA.

KRANE KAR speeds up handling of scrap. A foundry user says, "**KRANE KAR** can unload 50 to 55 tons of pig iron and malleable scrap in 3 hours . . ." Steps up unloading from gondola cars into storage piles and bins, and loading of scale cars and charging buckets. Lifts and transports flasks, patterns, sand moulds, and castings with magnet, hook, or bucket. Magnet also handles skull-crackers. **KRANE KAR** may be operated by any man. Ask our nearest agent how to prune your materials-handling costs for modern, economical foundry operation.

USERS: Fargo, Howard, Coeur d'Alene, United Eng. & Fdry., Bethlehem Steel, Birdsboro Steel, Ohio Steel, Hartford Electric Steel, Harrisburgh Steel, U. S. Steel, Detroit Gray Iron.

Visit our Exhibit at the National Materials Handling Exposition, Cleveland Auditorium, Jan. 14-17, 1947, Booth No. 101.

Write for Our New Catalog No. 58

THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER

2½, 5, AND 10 TON CAPACITIES

KRANE KAR

TRADE MARK REGISTERED

SILENT HOIST & CRANE CO., 885 63rd ST., B'KLYN 20, N.Y.

HAPPY NEW YEAR

May you continue to speed production up to 600%, cut costs 75% throughout the year with. . .

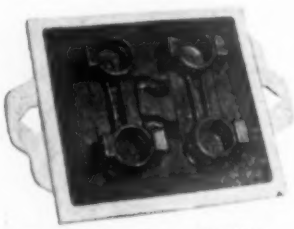
TAMASTONE

Read this report of 600% INCREASE

Cope Side shows 3" high white metal section set in TAMASTONE used to thin projections plus fact 2 ram-up cores must be used.

★ *Amazing yet true!* . . . because with original loose pattern equipment, the foundry was only able to produce 35 molds—castings per day . . . but, with TAMASTONE, production jumped to 110 molds—220 castings. OVER 600% INCREASE!

Here's how TAMASTONE did the trick . . . a duplicate TAMASTONE pattern was made. These were then used in a 14x16 flask. Check photos—see how simple it was to step up production. Write for literature on Foundry Specialties.



Drag Side entirely of TAMASTONE—3½" draw cup pattern.

TAMMS SILICA CO.

228 N. La Salle St., Chicago 1, Ill.

★ Photos courtesy of Efficiency Match Plate Co., Chicago.

(*Continued from page* 218)

ture critically from the standpoint of what can be done to better its position.

For many years the pattern shops of this country have been making a much larger contribution to progress than they themselves appreciate or realize. During the war years the help rendered by this industry was absolutely indispensable to success. Here is an industry estimated to embrace thousands of plants throughout the country, close to 20,000 employees, and annual sales of many millions of dollars. Let us check briefly through our routine day and note the many activities with which the product of the pattern shop and foundry is closely identified.

When our alarm clock announces time to start another day, we can reflect that the clock was made possible by the use of equipment produced by the help of foundries. We arise from a bed which may carry many castings, or at least was manufactured from equipment made in the foundries. As we draw the water for that morning shower, do we properly appreciate the fact that only through the use of many castings is the water brought to us and made available in the manner we want to employ it? As we enjoy that last minute rub down, we are reminded that the towel was produced by equipment made possible by our foundries.

Castings Used All Day

And so it goes with every single activity throughout the day. Without the use of castings it is hard to visualize how food could be produced and brought to our cities; how we could transport ourselves from one point to another; how we could operate our manufacturing establishments, offices, hospitals, or carry on with any other activity.

Most revealing, you may say. I never thought of it just that way! *There* we have put our finger on *something*. We *have never thought of it just that way.* Those of us in our own industry have not and do not appreciate the very necessary and important part our product is playing in our daily peacetime life!

The important point, of course, of all these comments is that all castings and many other types of construction have their inception in the pattern shop. We members of an industry—one of the most important, if not the most important, industry in the country—have been thoroughly complacent over the years, sat back, said nothing about our accomplishments, and are now beginning to wonder why we are not receiving more recognition.

Take some of our more important developments in the industry, such as the production of matchplates by the use of

(*Continued on page* 222)

The right oven for your work pays dividends in maximum production and lower costs!

There's a time-proven

CARL-MAYER OVEN

for every foundry need

Those in charge of production in America's leading foundries know their responsibility. To insure fast core baking, uniform core baking with operating economy, Carl-Mayer oven equipment is chosen repeatedly.

Want the users' verdict? We'll gladly arrange contact with customers in your locality. *Write for Bulletin.*

RACK
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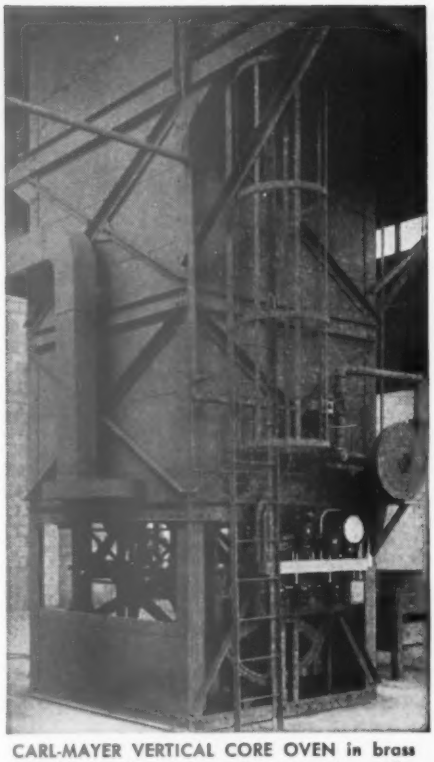
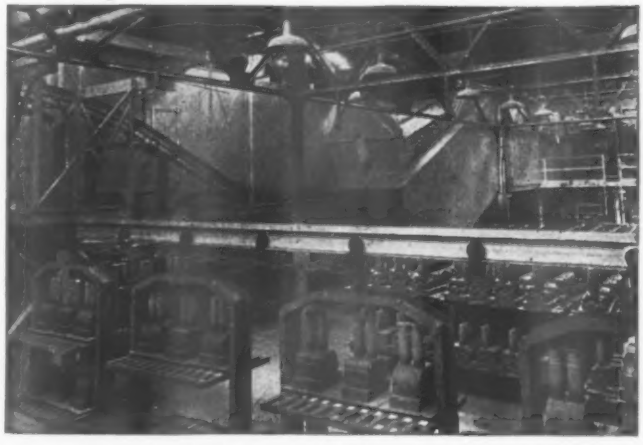
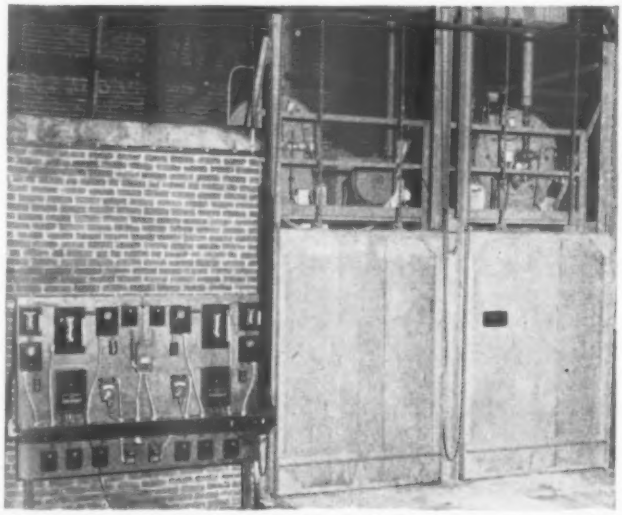
SHELF
(Quick Dry)
PORTABLE
DRAWER
VERTICAL
MONORAIL
AND
HORIZONTAL
CONVEYOR
TYPES



CARL-MAYER VERTICAL CORE OVEN in brass foundry of The H. B. Salter Co., Marysville, Ohio, manufacturers of heating and plumbing fixtures.



CARL-MAYER MONORAIL CORE OVEN at Packard Motor Car Co.



Two Recirculating Oil Fired Double Rack Type Core Ovens with Lift Doors, as installed for The Crucible Steel Castings Co., Lansdowne, Pa.

IMPORTANT CONCERNS LIKE THESE HAVE CHOSEN CARL-MAYER OVENS:

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American Radiator Co.
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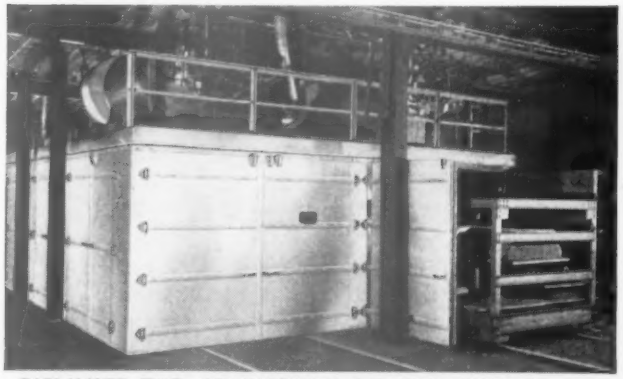

CARL-MAYER TWO COMPARTMENT CAR TYPE OVEN for cores and molds. Also has doors on side permitting its use as a rack type oven.

ELIMINATE SWAB,
Brush and Spray Can and
IMPROVE Production
and Quality of Work

BLACKEN MOLDS

with the
MURPHY PISTOL SPRAYER

Blackening reaches hidden pockets as well as all accessible surfaces and is driven into the pores of the sand by air pressure. Molds are blackened faster! Castings peel better! Work comes cleaner!

SATISFACTORY PERFORMANCE GUARANTEED OR MONEY REFUNDED

Trigger control means effortless handling and economy of air consumption. Used for Silica wash, oil, water or any liquid material. Used for sand blast cleaning of permanent molds and castings. Without suction hose the Murphy Pistol Sprayer becomes a perfect blow gun, used to advantage for the cleaning of motors and machinery.

Prices, complete with Suction Hose and Sinker

Pipe Size	Price FOB Hamilton, O.
1/16"	$10.00
1/8"	10.00
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3/8"	12.00
1/2"	15.00

(There has been no increase in these prices since 1910).

If your dealer cannot supply you, order direct . . . literature on request. Address Dept. A-11.

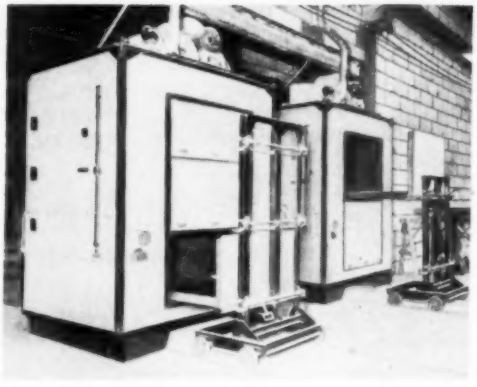
GUARANTEED COMPRESSED AIR PRODUCTS

AFTERCOOLERS • SEPARATORS • STRAINERS • TRAPS
SPRAY GUNS • PISTOL SPRAYERS

JAS. A. MURPHY & CO.
HAMILTON, OHIO, U.S.A.
Moisture Elimination Up To 3000 Pounds Per Square Inch

ONE OF MANY GEHNRICH CORE OVEN TYPES

Get Extra Advantages
with this
PULL DRAWER
Recirculating
CORE OVEN



- No overhead track projecting in front of oven to obstruct cranes or moving material.
- Drawers supported on puller mechanism moving on ball bearing wheels on floor.
- One or more drawers of any dimensions may be withdrawn from oven simultaneously. Loading is easy—convenient.
- All insulated Dual Panel Oven equipped with gas, oil or electric, internal or external air heater and cross-flow recirculation system for uniform heating of cores.
- Oven may also be used for mold drying, low temperature annealing, baking finishes, drying, etc.
- Built to meet your specific production requirements.

What do you want to bake . . . what quantity . . . what cycle? Get our recommendations.

GEHNRICH OVEN DIVISION W. S. ROCKWELL CO.
Batch and Conveyor Ovens for Core Baking; Drying, Heat Treating
210 ELIOT STREET • FAIRFIELD, CONN.

(*Continued from page 220*)

plaster, production of permanent mold castings, various uses of green sands and production of special patterns for this service. All of these developments, to mention only a few, have had a most important part in our country's progress. Yet have we as patternmakers taken the time or made the effort to tell anybody about these very worthwhile accomplishments? These are things that a well organized, properly co-ordinated national trade association can and should do for its members. There is nothing new about it; it is merely applying the principles that other industries have used successfully for years.

On the other hand, we recognize the industry has problems, as does every other industry. Best results can be secured in solving these problems through joint co-operation. Here again the national trade association can do an outstanding job and earn dollars for pennies spent in its support. We must continue and greatly expand our efforts to provide pattern equipment for the most economical methods of casting production. Too many in our industry give their first thought to how cheaply certain equipment can be produced. It is outstanding that progressive shops will produce only the best type of equipment—that which will cut casting cost to the minimum as well as furnish the best type of castings—and then have the intestinal fortitude to go out and sell that equipment at a profit.

Must Correct Condition

Our failure over the past to do this more generally has driven designers and manufacturers to use fabricated constructions of various and sundry types, many of which are less desirable than the tried and proven castings. This shortsightedness will prove to be a serious matter as time goes on if we do not take steps to correct it.

The lack of cost knowledge in our industry calls for attention in this direction. Successful, outstanding industries have, in almost every case, developed a uniform cost accounting method for their industry and have taken the time and spent the money to makes it available for general use in the industry. I venture to say that if all the time which has been spent in your generation and mine by pattern manufacturers in merely using profanity when pattern equipment sales are below cost had been applied to developing a worthwhile, practical, efficient cost system and having it generally used, we would today find ourselves in a very, very much more desirable position profitwise as well as from the standpoint of prestige.

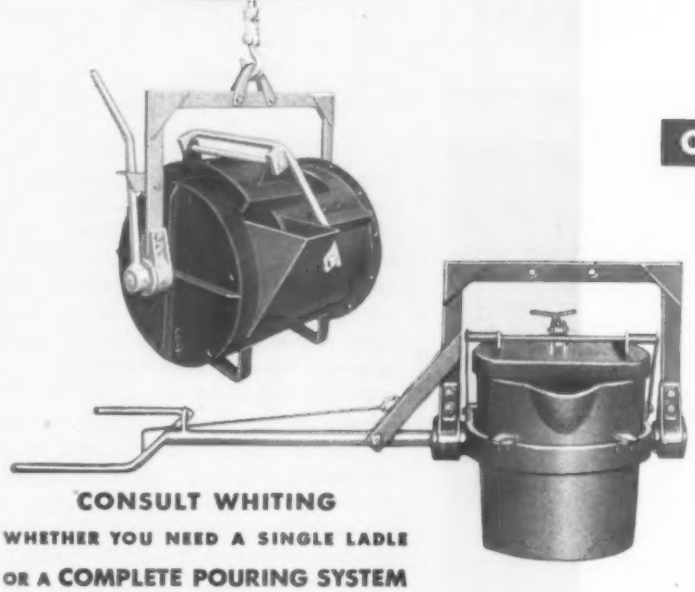
Let me emphasize that all is not lost.

(*Concluded on page 224*)

TO HANDLE HOT METAL MORE EFFICIENTLY WHITING OFFERS NEW...

Pour-Rite LADLES

- ✓ EASY, ACCURATE POURING
- ✓ TROUBLE-FREE OPERATION
- ✓ LOW MAINTENANCE
- ✓ LONG LIFE



CONSULT WHITING
WHETHER YOU NEED A SINGLE LADLE
OR A COMPLETE POURING SYSTEM

CONSTRUCTION FEATURES

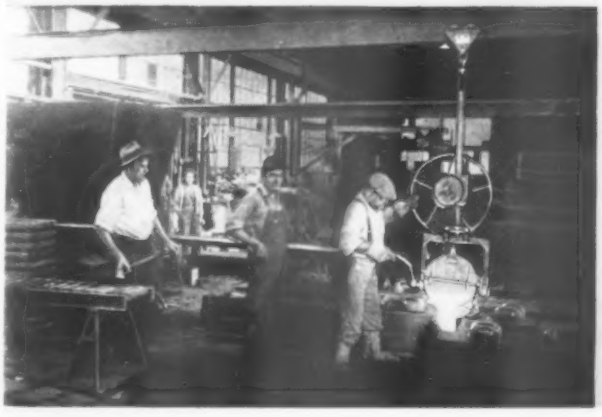
BOWLS: All-welded from extra-heavy steel plate, with welded reinforcing and welded pouring lips.

TRUNNIONS: Air-cooled and protected by shot guards.

GEAR BRACKET: Built-in alignment; backlash adjustment; automatically self-lubricating.

BEARINGS: Antifriction type, self-aligning.

Available in a wide range of sizes. New Bulletin FY-144 describes more than 200 Whiting Ladles—for every foundry use. We will send it gladly on request.



WHITING CORPORATION

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Offices in Chicago, Cincinnati, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco, and Washington, D. C. Agents in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario. Export Department: 30 Church St., New York 7, New York.

A Good Save!

Don't scrap those castings when surface blemishes appear. Use Shelton Metallic Filler—the patching cement that beats 'em all for fast drying, hard setting. Free sample on request.

SHELTON METALLIC FILLER

PRODUCT OF

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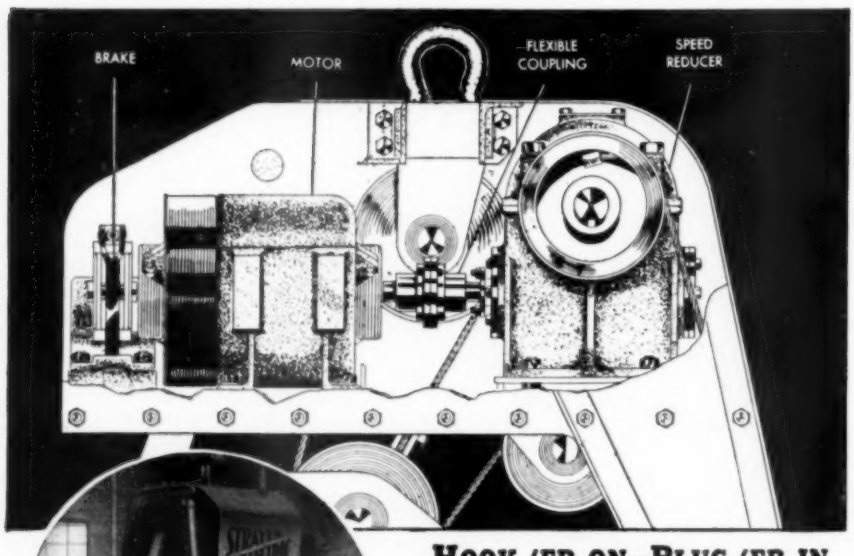

HOOK 'ER ON—PLUG 'ER IN

ABOVE YOU SEE WHY the Erie Electric Bucket works in its own headroom controlled from the crane cab. This sturdily constructed bucket needs only to be hooked over the crane hook and power line plugged in. The man in the cab controls the opening of the bucket from cracking the lips to any degree of opening or closing. The extra in-built weight permits easy penetration. *Write for complete particulars.*

ERIE STEEL CONSTRUCTION CO
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ERIE BUCKETS
THE MOST COMPLETE LINE BUILT

» ALSO AGGREMETERS
ELECTRIC OVERHEAD CRANES
PORTABLE CONCRETE PLANTS

(*Concluded from page 222*)

It is not too late for this industry to take hold of the situation and improve conditions. It would seem that specialization—working in the field in which one is best qualified to perform by reason of past experience—is one thing that should be practiced. We should aim to produce equipment of the highest type that will produce castings for the lowest cost, then put forth our best efforts to sell it. This type of equipment will keep down castings costs and that in turn will keep out competitive constructions.

Our shops should be checked from the standpoint of ascertaining if we are using the most efficient type of equipment. Proper production equipment is the first essential to good patterns. Does your plant carry sufficient equipment to properly remove dust and other manufacturing accumulations? Is your housekeeping in order?

What is the outstanding feature in connection with the success of the joint effort of many industries which have improved their lot by the employment of industry promotion? It is very simple. It can be summed up in one word, namely, co-operation.

Too many people who call themselves businessmen look upon co-operation as something which runs one way with themselves on the receiving end.

Members Work Together

One outstanding development of sound co-operation is the change for the better which is always brought about when members of an industry work together. That in turn is followed by constructive selling. Constructive selling is something each successful industry *must* achieve. Recently there has been inaugurated a movement known as the National Castings Council, which has for its purpose the elevating of the entire castings industry and improving the position of castings as such. Careful thought is being given to a well rounded, soundly conceived program. This is something in which patternmakers have a direct interest. The first step which should be accomplished is to organize your industry into a soundly conceived national trade association which will do some of the things described. I reiterate, there is nothing new about this recommendation; it is merely applying to your industry the successful accomplishments which others have proved time and time again pays dividends.

If all elements in the foundry industry will get behind such a program as that of the National Castings Council, the speedy manner in which benefits will begin to flow to your industry and to those to whom you sell your product will prove amazing.

WORKING OF METALS
Is Ancient Industry

By H. G. WELLMAN
Vice President
Wellman Bronze & Aluminum Co.
Cleveland

ARCHAEOLOGISTS divide the early history of the world into three periods known as, first the stone age, second the bronze age, and third the iron age, while a fourth, to be known as the light metal age, might be added. The stone age was the earliest stage of human civilization. Man had gained no knowledge of metals—the weapons and utensils which he required were formed of stone or bone.

The bronze age started by the accidental alloying of tin and copper in locations where the natural outcropping of nearly pure copper was melted in the presence of tin ore. The word copper probably came from the word cyprium, which in turn came from the word cyprus, as most of the early copper came from the isle of Cyprus in the Mediterranean. The ancient Greeks and Romans were bronze artisans as far back as 4000 B. C. Early Chinese coinage as well as weapons were made about the same period.

It was not until modern times that the really great deposits of copper were found. The purest copper in the world was discovered in the Lake Superior district of Michigan in the early 19th century. Here they have mined pure copper as deep as 2 miles under ground where temperatures become so high that cooling by forced ventilation is necessary and men can work only 2 hr at a time. Due to these difficulties most of the copper in the United States is now mined in districts similar to Colorado and Montana where lower-grade deposits are found but which allow a very much cheaper method of mining to be practiced. Up to 1830 the British produced 60 per cent of the world's copper but by 1890 the United States had exceeded them to produce 60 per cent of the world's copper.

Tin was used as a metal thousands of years before the dawn of history. However, prehistoric bronzes were not necessarily made with metallic tin. The tin referred to in the bible was really a copper alloy known in Egypt as early as 1600 B. C. By 100 A. D. the Greeks had a word which designated tin. The metal was imported from Cornwall in the British Isles into Italy about the time of the invasion of Britain by Julius Caesar.

Many Roman historians of that time did not realize the distinction between tin and lead. Grains of metallic tin appear in Siberian and Bolivian deposits intermingled with gold ores. Over five-sixths of the world's tin production is derived from secondary alluvial deposits. All of the tin which came from Cornwall or Bolivia was from vein mining. During the 18th century the world's supply came from England, Saxony and Bohemia. Later it was found in the Island of Banka, then Billiton and later the Straits Settlements which have been the largest consistent producers in modern times.

Lead was used as far back as 3000 B. C. The Romans used it to make water pipe, which was mentioned in Old Testament history. The ends of the pipes were soldered together with an alloy of tin and lead. The chief supply of lead in the world is found in an ore called galena. It was found in the early days in Derbyshire, England as well as in Scotland and Wales. The largest American deposits have been found in the Rocky Mountains centered about Leadville, Colo. This deposit was discovered in 1877.

Ore Contained Zinc

The Greek Aristotle, about 350 B. C., tells of his people using an ore which probably contains zinc, because when it was melted in the presence of copper the result was a peculiar yellow alloy which later became known as brass. Zinc was found in early years in an ore known as blende in Germany, Belgium and England. Its smelting started in England in 1730. In Europe the first smelter was built in Belgium in 1807. The United States started smelting of zinc ores in 1873.

In 1722 a French chemist by the name of Hoffman announced the discovery of alumina as an individual substance, then 90 years later, about 1809, Sir Humphrey Davy produced in England an iron aluminum alloy which he called alumium. However, no one was able to separate aluminum until 1886 when Heroult in France and C. M. Hall in the United States simultaneously developed an electrolytic process for the separation of aluminum. This work was made possible by the development of electric generators which gave them the necessary electric current for their process. Production of aluminum in the United States on a commercial scale started in Pittsburgh in 1888, using bauxite as a raw material.

Magnesium was produced first in a laboratory by an Englishman named Bussy in the year 1830. After this, experimental plants were started in a small way in several places, but it remained for Bunsen in 1853 to separate pure magnesium by electrolysis of fused magnesium chloride in a porcelain crucible. This led to the later starting of the first electrolytic magnesium plant near Bremen in Germany. Working on the development of magnesium alloys and methods of fabrication, they called their product "Elektron." The Germans started their magnesium industry using carnalite, a double salt of magnesium chloride and potassium chloride, from the huge Strassfurt deposits.

During World War I magnesium was in great demand in Europe and to certain extent in the United States, due to its use in flashlight powders for photography, and as a deoxidizer in the manufacture of nickel, as well as in the manufacture of some airplane castings in Germany. Great pressure was brought to bear on the new industry to develop alloys that could be used commercially for the new air machines. Its very light weight in comparison with any other metal made it exceedingly attractive to the manufacturer. However, the World War I was over before the cost of manufacture of magnesium in the United States was low enough to make it possible for war use in the airplane industry.

The Dow Chemical Co., Midland, Mich., had plenty of magnesium chloride left over from its chemical processes utilizing the salt brines under the Midland territory. The separation and production of magnesium intrigued Dr Herbert Dow to the extent that he spent many thousands of dollars and necessary time in working out a process for manufacture. In July, 1916, Dow made its first 1-lb piece of magnesium by an electrolytic process worked out in its own plant. It required several years, however, to perfect this process until it became commercially satisfactory. This was really accomplished in 1922 when the first sand castings were made, using an alloy of over 90 per cent magnesium with some aluminum and manganese. This attempt to make sand castings called forth considerable new chemical experimenting due to the fire hazards met with in pouring magnesium into sand as well as the melting of the metal in free air. This difficulty was worked out quite satisfactorily prior to World War II which enabled the United States to secure for its enormous aircraft development all of the metal needed to carry on the air war which ensued.

This article is from a paper presented by the author at a meeting of the Cleveland District Chapter, Non-Ferrous Founders' Society.

New Equipment *and* Supplies

(1)—Crane Control: General Electric Co., Schenectedy, N. Y.—Pendant pull station control, a completely new system of control, is designed for floor-operated cranes. Furnished for use on ac or dc motors up to 15 hp at 220 v, the system can be used on cranes ranging from simple hoists to three-motion bridges, providing them with the same smooth operation and control refinements as cab-operated cranes. Control system consists of a small magnetic control panel mounted on the crane and connected by a cable to a pendant station suspended from the crane. Pendant station has one pull handle for each direction of crane motion and can be operated with one hand. An emergency stop button is provided for instantly cutting off power from all crane motors.

1

(2)—Induction Furnace: Ajax Engineering Corp., Trenton, N. J.—New 125-kw induction melting furnace for aluminum and aluminum alloys is designed for melting finely divided particles such as turnings, chips and unbaled foil. Furnace is operated on the twin coil induction principle and is said to yield 93 to 96 per cent of the dry weight of the charge. It operates on standard frequency power lines of 25, 50 or 60 cycles. As the photograph shows, the pouring spout is located in line with the furnace rotating axis, making direct pouring into molds easy. A hydraulic ram with flexible chain tilts the furnace, and all molten metal in the furnace can be discharged. The electric controls are concentrated in a control cubicle which also houses the temperature control instrument.

2

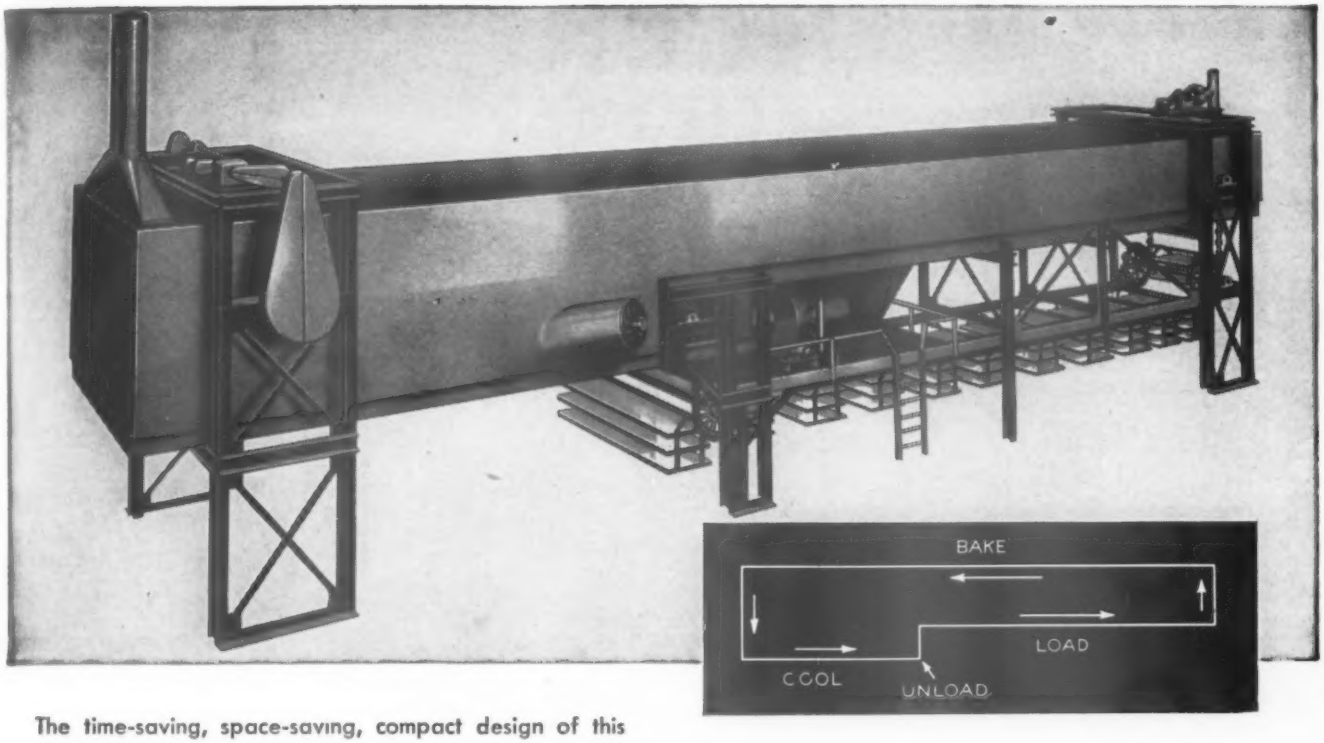
(3)—Chain: S. G. Taylor Chain Co., Dept. S-11, Box 509, Hammond, Ind.—Patented triple magnet chain is said to be longer lived than conventional magnet chains. A 60° twist in two of the three connecting links serves to keep the links of the legs perpendicular to each other, thus reducing wear from gouging and kinking. Special alloy steel having 100 per cent more tensile strength than low carbon steel or wrought iron is used in manufacturing these chains. Its resistance to shock, grain growth and work hardness eliminates the need for periodic heat treatment.

3

(4)—Density Indicator: Harry W. Dietert Co., 9324 Roselawn Ave., Detroit 4—Molding sand density indicator shows weight in lb per cu ft of any molding material under a chosen degree of ramming compactness or under an AFA standard sand specimen degree of ramming. Indicator may be attached to any AFA sand rammer by means of two screws. In testing, a known weight of molding material is placed in a 2-in. diam specimen tube and rammed with a selected number of drops of the sand

(*Continued on page* 228)

4



The time-saving, space-saving, compact design of this new Horizontal Core Oven is characteristic of Young Brothers' Engineering. Into it went the skill and confidence of many years of experience . . . also a thorough knowledge of the job to be done and the production problems involved.

This new core oven can be installed in practically any building without making any major structural changes.

The coremakers are located right next to the oven so that they can load the cores directly on the moving racks thus eliminating the necessity of transporting them on hand trucks or a conveyor from the core room. The location of the coremakers, at the oven, also saves core room space.

The size of the loading racks can be varied and the shelves can be adjusted to accommodate cores of many sizes and shapes.

Besides allowing for the removal of exhaust gases at the point of greatest concentration, the new oven design provides an effective cooling zone for the cores and assures comfortable working conditions for the coremakers.

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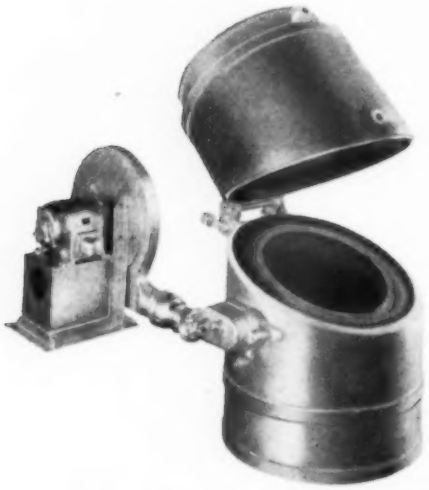

Because the Iler Crucible Draw Furnace opens up as shown, crucibles are easily and quickly removed and replaced, saving time in handling. No tongs nor overhead equipment is required. Pouring is direct, eliminating overheating of metals. Heat, trapped in the upper section cuts reheating time, speeds up melts, saves fuel costs. An automatic air lift opens and closes the furnace at the touch of a valve reducing labor fatigue. Furnace sets on floor, needs no pit.

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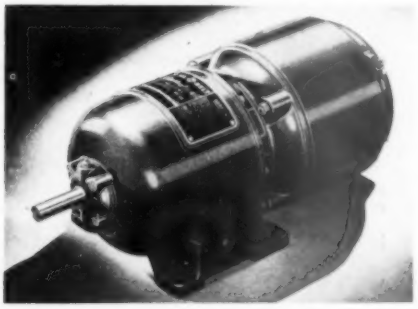
(*Continued from page 226*)

rammer weight. Pointer will show the weight in lbs per cu ft for that material when rammed to that specific hardness.

Lift Truck: Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 14—New fork-type power lift truck has an elevating reach of 18 ft above floor level and is especially useful for high tiering materials and merchandise. New

truck picks up loads on its bare fork or on pallets and will lift 4000 lb to 11 ft and 3000 lb to 18 ft. It is electrically driven with three separate motors; one each for traveling, operating the lift and tilting the upright columns. Tilting limit is 15° backward and 5° forward from vertical. Body of the truck is independent of the uprights and fork is 7 ft, 8 in. long. Overall width 3 ft, 2 in.

Fluid Drive: Link-Belt Co., 307 North Michigan Ave., Chicago 1—New drive is a compact, motorized hydraulic combination consisting of a gen-



eral purpose ac induction motor flange-mounted on a sturdy housing containing a hydraulic coupling. Output shaft may be direct-connected to the driven machine, to a speed reducer unit or through chain, gear or belt drives. Choice of motor size is based on the running horse-

(*Continued on page 230*)

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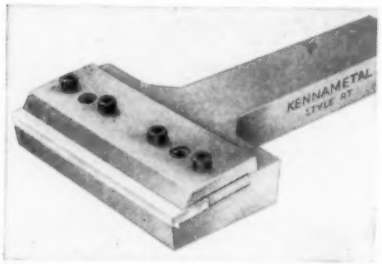
(*Continued from page 228*)

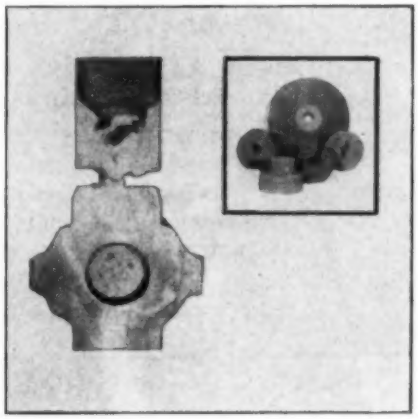
power, not on starting requirements. Motor torque is transmitted from impeller on motor shaft to runner on output shaft by light mineral oil in the coupling which serves as an automatic clutch and cushion to protect motor and driven machine from shock loads, making overload shear pins unnecessary. Smooth starting is assured, with the problem of inadequate torque and excessive high starting current peaks eliminated. Units are available in horsepowers up to 20.

Turning Tool: Kennametal Inc., Latrobe, Pa.—Broad-nose tools for turning cast iron rolls up to 90 Scleroscope are said to reduce production costs. Tool



consists of a solid Kennametal blade held by a heat-treated steel clamp. The blade has four cutting edges that may be used in succession before requiring sharpening; then it can be reground time and again until two-thirds of the metal has been utilized. The tools are available in four standard cutting widths—4, 6, 8 and 10 in.

Metals Feeding: Pittsburgh Metals Purifying Corp., 1352 Marvista St., Pittsburgh 12—Metals feeding compound for ferrous and nonferrous castings, known as Thermotomic X-235, is



produced in powder form and when mixed with water is molded into feeding ring cores or inserts and baked in the conventional manner. The compound raises the temperature of the cast metal, promoting better feeding into the mold and retarding solidification in those portions of the casting where rapid cooling may cause piping, shrinkage or segregation. Thermotomic X-235 differs from the company's regular Thermotomic compound in that it has a secondary exothermic reaction—having burned through once at 3000 F it reacts and burns a second time at 3400-3600 F. Accompanying illustration shows longitudinally split section of cast steel hydraulic nut with riser at top. Thermotomic X-235 feeding ring core was used under feeding head. Typical feeding rings are shown at top right of illustration.

Clamp Truck: Food Machinery Corp., Twelfth and Nicks Sts., Riverside, Calif.—One-man clamp trucks have, at the truck base, short squeezer arms that can lift a loaded box or boxes weighing up to 600 lb. Squeeze is applied by a foot pedal. Other features of the five models available include a front shield

to permit handling of heavily loaded boxes without spilling the contents, and a tilting frame which permits the carrying of a stack of boxes, or for extra leverage on heavy lifting.

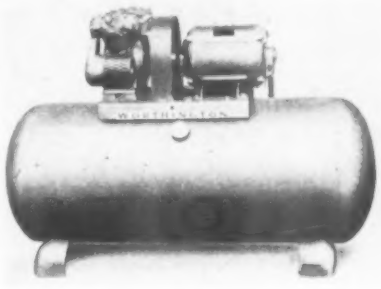
Control Units: General Electric Co., Schenectady, N. Y.—New line of oiltight push-button units, selector switches and indicating lights is designed especially for the machine tool and automotive industries. Protection against entrance of oil is provided throughout the line by a diaphragm seal and a rubber gasket. Push-button units are available with single pole providing a normally open and a normally closed circuit; three point unit providing two normally open circuits with common connection; and double pole units with either normally open or normally closed circuits. All contacts are double-break and made of silver. Selector switch unit

is available in single pole double throw or double pole single throw forms. Contacts are cam operated. Indicating light unit has the same single pole mounting arrangement as the push-button and selector switch units. They are available for 110-125 or 250 v, ac or dc, and may be used on higher voltages with separately mounted resistors.

Face Shield: American Optical Co., Southbridge, Mass.—New face shield provides extra overall protection

against impact of flying particles and splashes of acids, oils, alkalis, hot water, etc. Extra large window, 18¾ x 10 in., is made from cellulose acetate .040-in. thick. It extends completely around the face, even covering the ears. Comfortable and adjustable fibre head guard entire top of head as an additional safeguard against injury. Friction joints hold window securely in "on" or "off" guard position.

Air Compressor: Worthington Pump & Machinery Corp., Harrison, N. J.—New line of air compressors is designed around established motor horsepowers and includes single-stage and two-stage sizes for pressures to 250 psi for mating to standard 1 to 15 hp motors. Arrangements include self-contained



power driven models mounted on bases, or tanks and bare compressors, for either direct or V-belt drives. The new compressor line includes a new principle in

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automatic starting of compressors—a centrifugal clutch permits the driving motor to attain full speed before the compressor turns. This eliminates the need for starting unloaders, check valves, release and bleeder valves, etc.

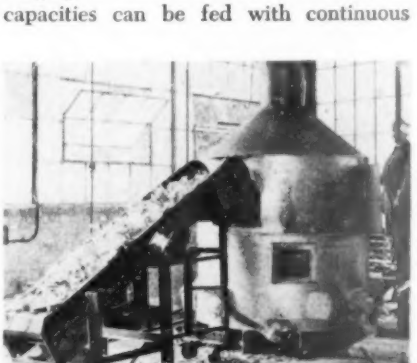
Truck: Salsbury Motors Inc., Pomona, Calif.—The principle of swiveling gun turrets in modern airplanes is utilized as the power "heart" of a line of industrial lift-trucks, tugs and cargo trucks. The turret is a cylindrical hood 2 ft in diam and houses a 6-hp gasoline engine geared to a drive wheel through fully automatic clutch and transmission. Equipped with this turret, the trucks will move in any direction, turn in little more than their own length and carry heavy loads—Turreteer carries 2 tons on platforms 42 to 72 in. long and 18 or 24 in. wide; Turretug, a tractor built for

trailer systems, exerts drawbar pull of 500 lb and has 28-in. turning radius; Turretruk is a 1-ton capacity cargo truck with large deck. Trucks will move at 8 mph and have no reverse gear because the turret turns completely around.

Exhaust Valve: Mead Specialties Co., Dept. EV 8, 4114 North Knox Ave., Chicago 41—New exhaust valve speeds up number of air cylinder strokes in air power devices by approximately 67 per cent. Acting on the principle of a bellows to expel the air more quickly the unit automatically opens as soon as the air supply is shut off, thus speeding up the return stroke of the air cylinder. Dimensions, exclusive of nipples, are: Body diam, 1¾ in.; height, 1½ in.; length, 2¼ in. Both nipple openings are tapped ¼ in. standard pipe thread. Valve can be attached directly to air cylinder or cut into air hose adjacent to cylinder.

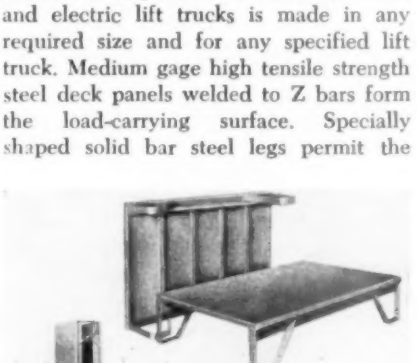
Air Filter: Beach Precision Parts Co., 120 Mechanic St., Boonton, N. J.—Air conditioning unit extracts scale, rust, dirt, moisture and oil fumes from compressed air used in operating pneumatic tools. Unit has valve and gage for regulating air pressure to any desired level lower than intake pressure. Units are panel mounted and come in two models—one will handle 30 cu ft of air per minute at 100 psi and the other 65 cu ft of air per minute at 100 psi. Filter elements are readily replaced.

Alloying Pot: Bellevue Industrial Furnace Co., 2971 Bellevue Ave., Detroit 7—Gas fired, die casting alloying pots, ranging in size from 2000 to 10,000 lb capacities can be fed with continuous



type conveyor. They have a temperature range of 350 to 1200 F and are designed to be fed to capacity every hour. In the 6000-lb size (shown here) the material is fed to the furnace at the rate of 1000 lb every 10 minutes, giving a total capacity of 6000 lb per hr. They are used in die casting plants for reclaiming sprues and other scrap and for alloying die cast metal. Special sizes can be supplied to specification.

Skid Platform: Market Forge Co., 18 Garvey St., Everett 49, Mass.—All-steel skid platform for use with hand and electric lift trucks is made in any required size and for any specified lift truck. Medium gage high tensile strength steel deck panels welded to Z bars form the load-carrying surface. Specially shaped solid bar steel legs permit the



platform to be stacked on end when empty. No bolts or rivets are used in construction of the platforms which are 15 to 20 per cent lighter than conventional types with a greater strength/weight ratio. The skid platforms are available with integrally welded corner stake sockets.

SYNTHETIC SAND IN THE NONFERROUS FOUNDRY

(*Continued from page* 85)

clay types and contents, natural bonded sands, moisture, pouring time, pouring temperature, etc. Though none of these variables per se proved to be the antidote for buckling, results of tests found the following factors conducive to its elimination:

1. Very wide grain size distribution, from 30 to 200 AFA, in lieu of a concentrated distribution. The latter apparently possesses superior thermal stability.
2. Use of anti-binders such as wood flour. When used, a minimum of 1.8 per cent is needed in anti-buckling mixes. This material provides padding and filler between the grains, giving greater moisture tolerance, and reduced thermal expansion to protect against defects caused by sand movement under change of temperature. The weakening in physical properties produced by the wood flour addition is partially compensated for by increased clay additions.
3. Lowest moisture and hardest ramming practically attainable.
4. Nailing. Used only as a last resort.
5. Short pouring time, under 35 seconds.
6. Venting large masses with piping and rods.
7. Use of pre-expanded sands heated to 1200 F, or refractories having smooth expansion curves (periclase and sillimanite).

The last mixture, silicon carbide, is used where chilling is desired, in sharp corners, fillets, around bosses, and similar hot spot areas. There are two varieties of this mix—one for cores and one for green sand molding. Both possess three-fourths the chilling power of solid graphite, and three times that of green molding sand.

Core Sand Mixes—Table IV lists the core sand mixes used with the foregoing synthetic facings. The uses for each are indicated in the last column. It will be noted that the same base sands are used for both and that a fairly close compositional parallelism exists between core and facing sand mixes.

Space does not permit a fuller discussion of core mixes. In passing, it might be mentioned that experimental work is in progress employing solid oxidizing additions for burning the inorganics (oil, cereals, rosins) in the interior of cores, thereby reducing the quantity of residual gas-forming combustibles; also employing additions for

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developing extremely high hot strength properties fully adequate to resist cutting at bottom and opposite gate areas, as well as for developing readily collapsible cores to prevent building up of hot tearing, hindered contraction stresses. Considerable progress has been made in this direction. Results are too incomplete, however, for discussion in this paper.

Mold and Core Washes—The only improvement in the use of washes deserving of mention is the packaged preparation of them. Hitherto advance notice of 24 hours was required for all orders of washes. Bentonite clay needs that amount of time for swelling, colloidalization, and adjustment to water solution. Since invariably shop personnel did not give this advance notice, a method of preparation had to be devised which would give a satisfactory mix on the moment of call.

Wash mixes are now packaged in quart and gallon containers, two containers for each mix, one containing bentonite, water, and water glass, and the other containing dry powders consisting of refractories and organic binders. Packaging in this manner enables the part mixes to be kept on the shelf—without spoiling, fermenting, or settling—until needed, at which time they are mixed together, using a large ice cream type mixer, without any other additions, to the prescribed baume consistency. An example of a packaged wash is the following:

Container A—3.5 qt water, 0.14 lb bentonite, 0.57 lb water glass.

Container B—3.0 lb silica flour, 2.75 lb red talc, thoroughly mixed together.

When talc wash is requested, the ingredients of both containers are mechanically mixed together, yielding a wash of 1.600 sp gr.

Routine Control Devices—In conclusion, it might be of interest to mention the manner in which control is maintained over synthetic facing sands. To insure uniform mixes, batch after batch, day after day, accurate measuring devices are used to control the quantity of materials, times and temperatures employed, namely:

1. Rotary, propane-fired, sand drier. All new sand is dried at rate of 10 tons per hour to 120-140 F and a moisture content of 1.0-1.5 per cent.

2. Larry weight cars, 2000-lb capacity, springless, having 2-lb graduations are used for weighing all sand additions.

3. Water meter for measuring water additions accurately, to 1/16-gal.

4. Oil meter for measuring oil additions to same degree of accuracy.

5. Automatic time control switches on mullers. A 7-min mulling cycle is adhered to for synthetic sands.

6. Laboratory sand testing equipment. Every batch of new sand, preliminary to dumping on conveyor belt, is tested for per cent moisture. Adjustments are made if found to be not within the specified range.

Pilot Foundry Aids Product

(*Continued from page* 91)

A few typical jobs are shown in Fig. 2. Lou Faria, head of Reynolds' pattern shop and foundry, points out that success of such a foundry operation hinges almost completely on the man doing the work. He must have wide experience in coremaking, molding, pattern rigging, etc. Such a man is Albert Zaeh. He spent 26 years in the foundry of the local Standard Sanitary plant, 19 as foundry foreman; and 11 years as foundry foreman with American Brass & Aluminum Co., Louisville.

The Reynolds pilot foundry was opened Jan. 16, 1946, and is the only casting facility used by the company in the Louisville area. No production work is handled, only developmental jobs, including the making of Kirksite molds for forming sheet aluminum by the Guerin process. Since most castings made are small and only a few are poured at a time, melting is handled by a gas-fired crucible furnace with a capacity of 60 lb of aluminum.

No natural gas was available at this plant site, consequently gas condensed to liquid form is delivered at the site by tank truck, 900 gal being obtained at a time to leave a margin in the 1000-gallon storage tank buried underground near the foundry. Evaporation develops a vapor pressure ranging around 30-40 psi in the tank. The gas goes through a reducing valve which cuts pressure to about 1 psi for the furnace where it is mixed with air from a blower before going to the burners. While the gas costs about 50 per cent more than natural gas on a cubic foot basis, it contains about three times the heat value—approximately 3400 Btu per cubic foot against some 1100 for natural gas.

The melting furnace sets in a partially open, 10 x 15-ft addition to the main building, see Figs. 1 and 3. Main foundry building, Fig. 1, measures 15 x 40 ft, is constructed of corrugated aluminum roofing and siding on an aluminum and wood frame.

The core oven (Fig. 5) also is fired from the same gas supply as melting

furnace. Oven working chamber measures 20 x 36 x 30 in. high. A sand box and work bench extends across the end of the shop opposite that where the melting furnace is located. An electric riddle hangs over the sand box on a tramrail extending the length of the box.

Fine grain sand (Albany 0 or 00) especially suited to casting aluminum is used. Core sand is usually a mixture of one part new sand and one part old sand. Molds are made up on a frame fitting into top of the sand box where a pattern has been placed on a plate ready to begin making a mold. The shop uses two sizes of flasks, 8 x 12-in. and 12 x 18-in., a dozen of each size being ample for the limited operation here.

Most castings are made from No. 356 aluminum alloy. A few employ No. 355 aluminum alloy where high strength is important. For ornamental work, golf club heads, book ends and similar pieces, Reynolds SA alloy, similar to the widely used No. 12 alloy, may be employed.

Fig. 6 shows the largest job ever attempted in this foundry. The job is a form block to be used in a hydraulic press in conjunction with a rubber upper pad for forming ceiling panels from aluminum sheet. This casting weighed about 90 lb when finished. How was it cast when capacity of melting furnace is only 60 lb? One ladle of metal was melted, set on top of the furnace while a second was melted. The first ladle did not contain a full charge as not enough heat would be available to maintain it at the desired temperature. Then the second charge was melted and the temperature boosted a little above the usual pouring temperature (which is around 1275 F—up to 1400 F for castings with very fine fins, etc.). This extra high metal temperature allowed some scrap to be melted down in the ladle from the heat of the molten metal. In this way, sufficient metal was obtained for the job.

Association Issues Production Books

American Management Association, 330 West 42nd St., New York 18, has available some informative literature pertaining to various phases of plant production. Bulletins entitled "Building a Cost-minded Organization," "Developments in Production and Management Engineering," "Industrial Engineering for Better Production," are obtainable at 75 cents each. "Work Simplification and Supervisory Cost Control," and "Incentives for Management and Workers", 50 cents each. "Foremen's Guide to Veteran Readjustment" is 15 cents.

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NEW TRADE PUBLICATIONS . . .

SHOT PEENING: American Wheelabrator & Equipment Corp., 505 South Byrkit St., Mishawaka, Ind.—128-page book presents a complete and detailed explanation of the shot peening process for use of engineers and production men. First part of the book discusses the applications and advantages of shot peening and the equipment and procedures involved. The second part covers the theory of prestressed surfaces in relation to shot peening, describing in detail how metal parts are strengthened by the process.

PYROMETER: Pyrometer Instrument Co., 103 Lafayette St., New York 13—Catalog 150 describes new immersion type pyrometer designed for nonferrous metals at temperatures up to 2300 F. Interchangeable thermocouples of the protected type, bare metal, closed end type and bare metal, open end types are available. Pyrometer has dust, moisture and shock-proof case, 4 in. direct reading scale, shielded housing, no exposed lead wires, internal automatic cold end compensator and is completely self-contained.

COLOR CONDITIONING: E. I. du Pont de Nemours & Co. Inc., Finishes Division, Dept. M6, Wilmington 98, Del.—32-page booklet illustrated in full color describes years of research and practical experience with color to increase production, improve seeing conditions and create a better working environment. The fundamental principles on which color conditioning is based and the "three-dimensional seeing" treatment of machines is explained and illustrated.

INSULATION: Industrial Mineral Wool Institute, 441 Lexington Ave., New York 17—Booklet gives case histories of fuel cost savings resulting from proper insulation of piping, flanges, drum-heads, driers, boilers and other hot surfaces. Typical applications are described, and formulas, data and a heat loss estimate sheet for the reader's use in calculating heat losses from his own equipment are provided.

POWER TOOLS: Master Electric Co., Industrial Equipment Division, Dayton 1, O.—Series of folders is offered describing hoists of 260 to 6000 lb capacities, electric hammers and attachments, individual power drives to replace line shaft and belting on power machinery, grinding machines and tools, gasoline or diesel fuel engine driven generators of 500 to 17,000 watt capacities, and other machinery and lighting equipment.

ALUMINUM MANUAL: Reynolds Metals Co., Dept. 47, 2500 South Third St., Louisville 1 — Aluminum alloy manual, "Heat Treating Aluminum Alloys," provides information readily usable by both the nontechnical man and the highly trained technician. Section 1 of the book presents the basic concepts of the metallurgy and heat treatment of aluminum alloys. Section 2 contains in brief tabular form the recommended thermal treatments for aluminum alloys. Section 3 comprises a more technical discussion of thermal treatments and photomicrographs of abnormal and normal metallographic structures. Book contains 144, 6 x 9-in., wire-bound pages. Price $1.

GEARSHIFT DRIVES: Lima Electric Motor Co., Lima, O. — Folder describes single unit four-speed sliding gear transmission and induction motor for powering individual machine tools. Units are available in ratings of 1/2 to 20 hp and deliver full rated horsepower at the output shaft at any of the speed ratios and in either direction of rotation. Motorless drives covering input torque ratings to 60 lb-ft are available for separate power sources.

VALVES: Foxboro Co., 32 Neponset Ave., Foxboro, Mass. — Bulletin 277-1, "Pneumatic Control Valves and Controller Accessories," contains information on colored enamel valve finishes corresponding with the color code of the American Standards Association, plates and tables of specifications for valves, the Vernier Valvactor or high accuracy positioning of valve plungers, and on air switches and subpanels for remote valve control.

OIL BURNER: Dempsey Industrial Furnace Corp., Springfield, Mass.—Bulletin No. 1 describes company's line of low pressure fuel oil industrial burners and accessories which can be applied to practically any industrial heating process, with either manual or automatic temperature control.

SODA ASH: Solvay Sales Corp., 40 Rector St., New York 6—64-page bulletin No. 5, "Soda Ash," contains information on the properties of soda ash, bulk shipments, storage, conveying and elevating, unloading of bulk, unloading of bags and barrels, weighing, proportioning and feeding devices, sampling and analysis, precautions and conversion tables.

FURNACE: Holcroft & Co., 6545 Epworth Blvd., Detroit 10—Bulletin describes the controlled atmosphere gas carburizing process and lists numerous possible furnace design features. The Holcroft procedure of designing each furnace individually for its specific application is outlined. Typical mass production gas carburizing installations are illustrated and described.

GENERATOR: Century Electric Co., St. Louis 3—Booklet describes generators and motor generator sets for ac or dc. Units are suitable for producing electricity for all general purpose light and power applications.

RADIATOR: D. J. Murray Mfg. Co., 1002 Third St., Wausau, Wis.—Company offers catalog CUH-846-A describing Grid Unit heaters; corrosion booklet, CI-455, dealing with grid's special construction, and bulletin CIR-345 describing the company's fin-type radiation.

SAFETY GUIDE: American Optical Co., Southbridge, Mass. — Booklet classifies body hazards by industries and recommends proper safety clothing and

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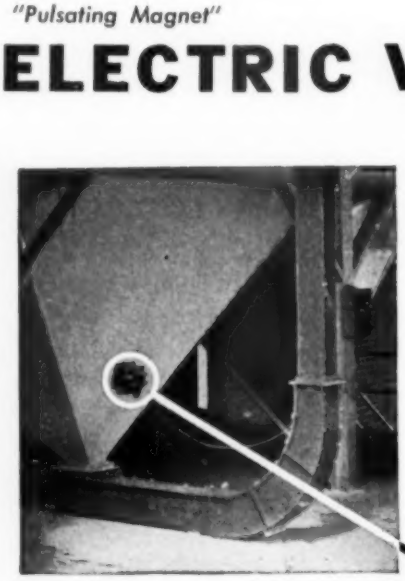

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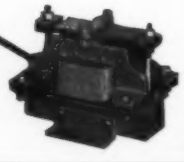

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equipment. The guide classifies 21 hazardous types of work in the 18 industries listed and includes pictures and descriptions of different types of safety clothing which should be worn for protection.

TRUCK LOADER: Clark Tructractor, division of Clark Equipment Co., Battle Creek, Mich. — Broadside describes new type fork lift truck small enough to maneuver easily in the loading area of highway trucks and trailers. Truck lifts 1000 lb load 84 in. on its elevating forks, travels at 5½ mph on gas and 4¾ mph on electricity, tiers the load, is 28 in. wide and overall length on gas model is 52½ in. and 53½ in. on electric model, excluding forks.

FLEXIBLE SHAFT MACHINES: Wyzenbeek & Staff Inc., 838 West Hubbard St., Chicago 22—Leaflet contains information on the company's line of flexible shaft machines, high speed grinders, tools and accessories. Available for delivery are flexible shaft machines from 1/4 to 2 hp, high speed grinders from 1/18 to 1 hp, sanding drums, brushes, buffs, grinding wheels and cutters. Specifications and prices are listed for all items.

REFRACTORY MORTAR: Quigley Co. Inc., 527 Fifth Ave., New York 17—Bulletin 315E describes plastic super-refractory surfacing mortar which resists slagging action, flame erosion, corrosive gases and abrasion. Mortar adheres to wall surfaces throughout the range of furnace temperatures (softening point, approximately 3300 F). Resists fluxing and reduces injury to brickwork in removing clinker.

CONVEYOR: Rapids-Standard Co., Dept. SB-173, 308 Peoples National Bank Bldg., Grand Rapids 2, Mich.—Revised 6-page folder No. SJA-46-6 illustrates and describes the Stevedore Jr. belt conveyor, including the cable-lift elevation device which facilitates adjusting the operating pitch of the belt while stacking materials at various levels. Conveyor is capable of moving 200 lb distributed load at 65 ft per minute.

INTERCOMMUNICATION: Talk-A-Phone Co., Chicago 23—Booklet describes the company's line of intercommunication systems available in 10, 20, 30, 40, 50, 60, 80 and 100 stations. Systems operate on 110-115 v ac or dc with substations as far away as 3000 ft. All systems are delivered as complete units with everything necessary for proper installation.

HOIST: Lisbon Hoist & Crane Co., Lisbon, O.—Booklet describes a new heavy duty electric hoist offered in 1000, 2000, 3000 and 4000 lb capacities. It is said to be the lightest, smallest and strongest hoist of any other hoist of similar rating. Gears and 1½-hp motor are entirely enclosed. It is available for 220 or 440 v circuits.

LUBRICATION CHART: Rapids-Standard Co. Inc., Dept. LC82, 308 Peoples National Bank Bldg., Grand Rapids 2, Mich.—Chart D182 explains how to lubricate and maintain operating efficiency of standard gear motors on the company's belt conveyors.

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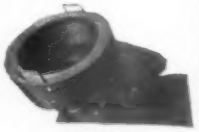

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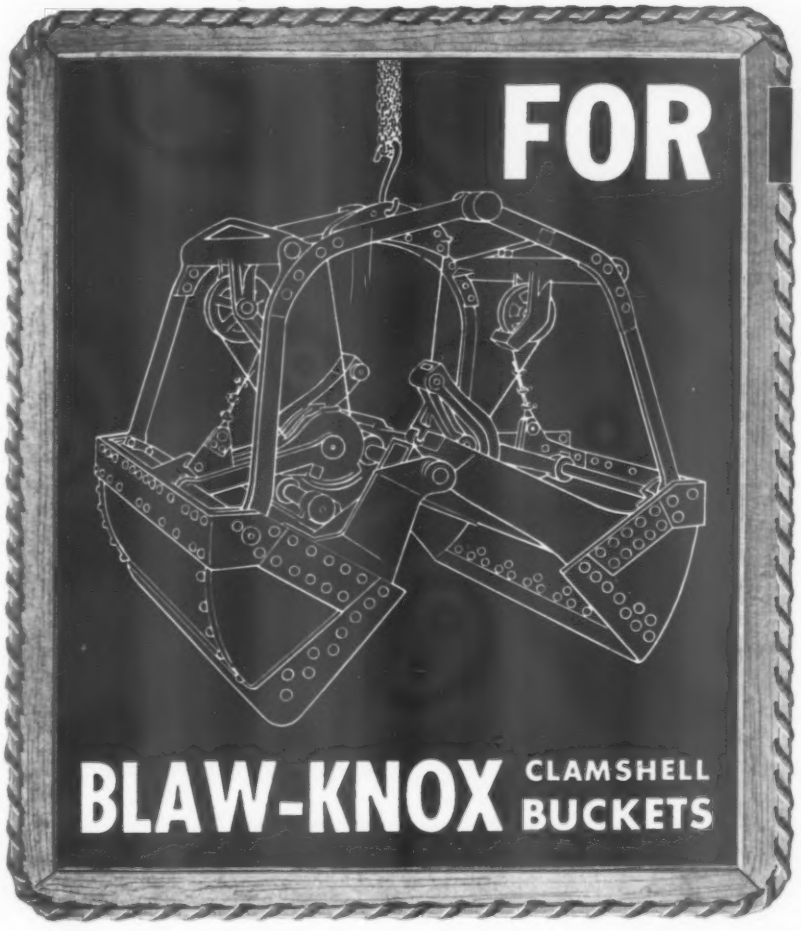

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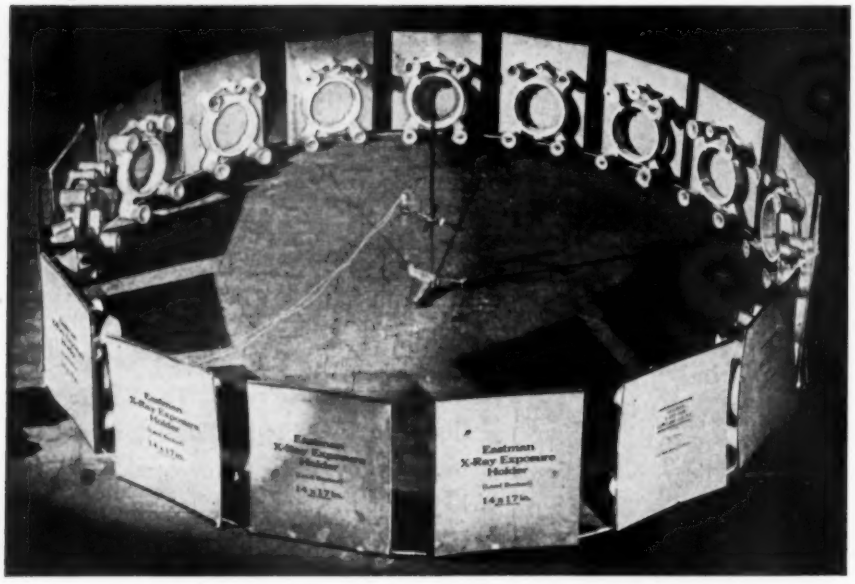

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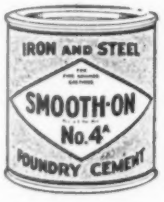

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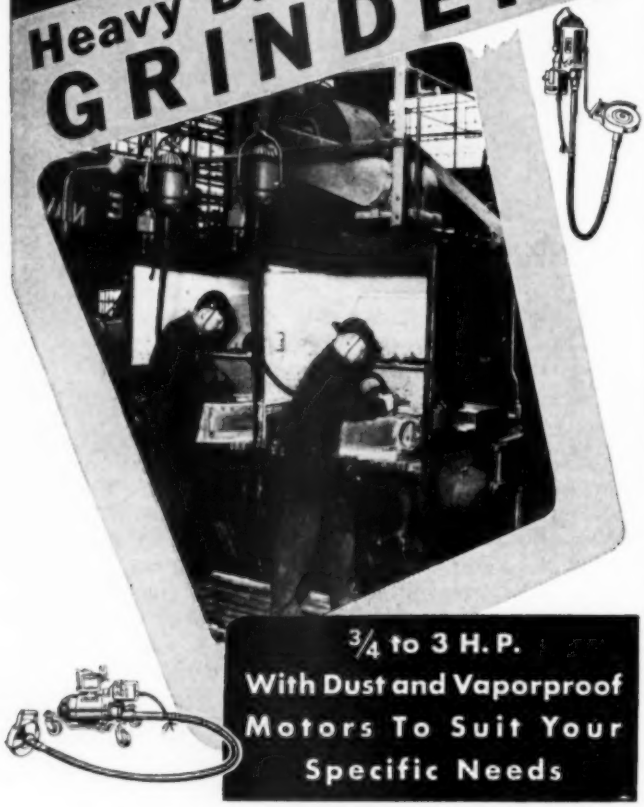

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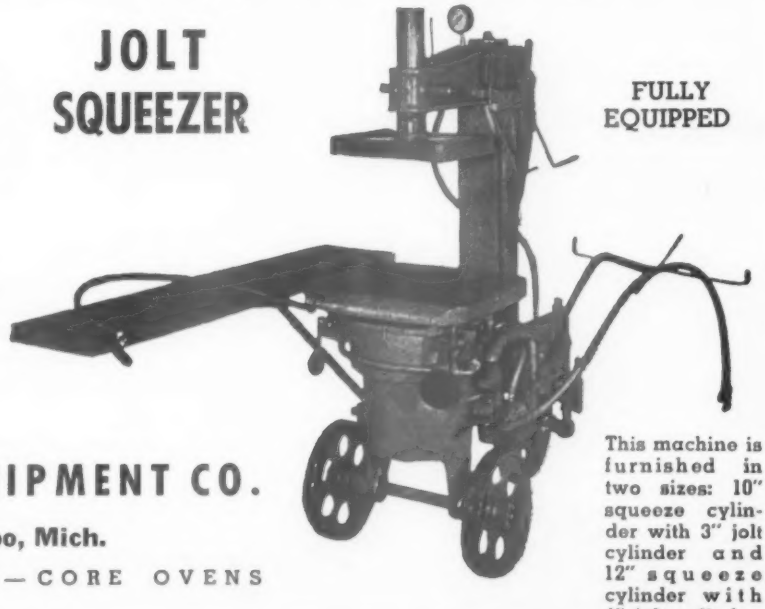

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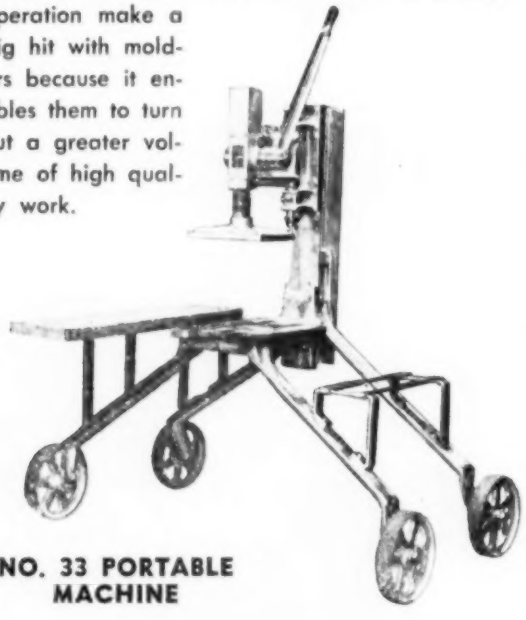
Yes, Moline Squeezers will make money for you by boosting production and reducing foundry cost . . . and with very little initial expense. Their simplified design, sturdy construction and easy operation make a big hit with molders because it enables them to turn out a greater volume of high quality work.



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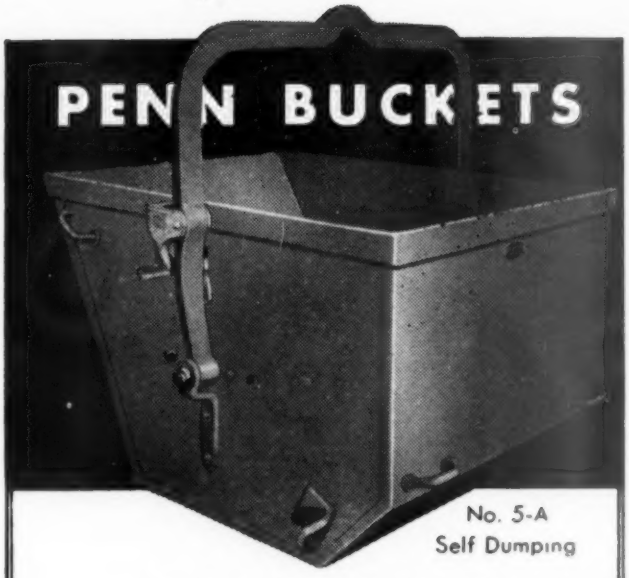
WRITE TO FACTORY FOR COMPLETE INFORMATION AND PRICES

MOLINE IRON WORKS

MOLINE, ILLINOIS, U. S. A.

PENN BUCKETS



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Self Dumping

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Cuts rises, gates, sprues, heavy or light sections of metals, sheet metals, wood and compositions

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for ALUMINUM AND OTHER NONFERROUS METALS. 45 SIZES.

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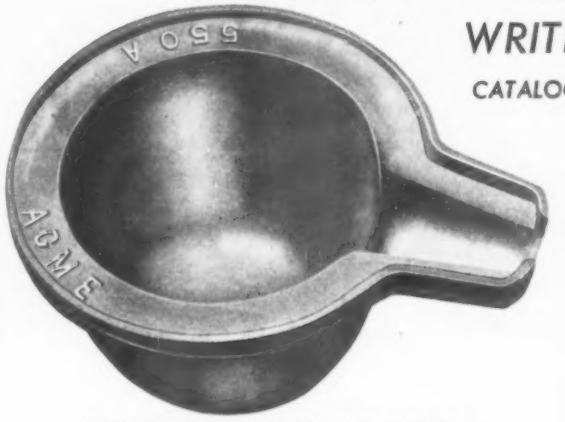
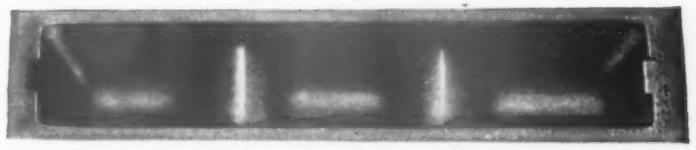


ROUND SPOUT POT NO. 550A
WITH 1½" COLLAR ON FLANGE

HOLDING BOWL NO. HP7001



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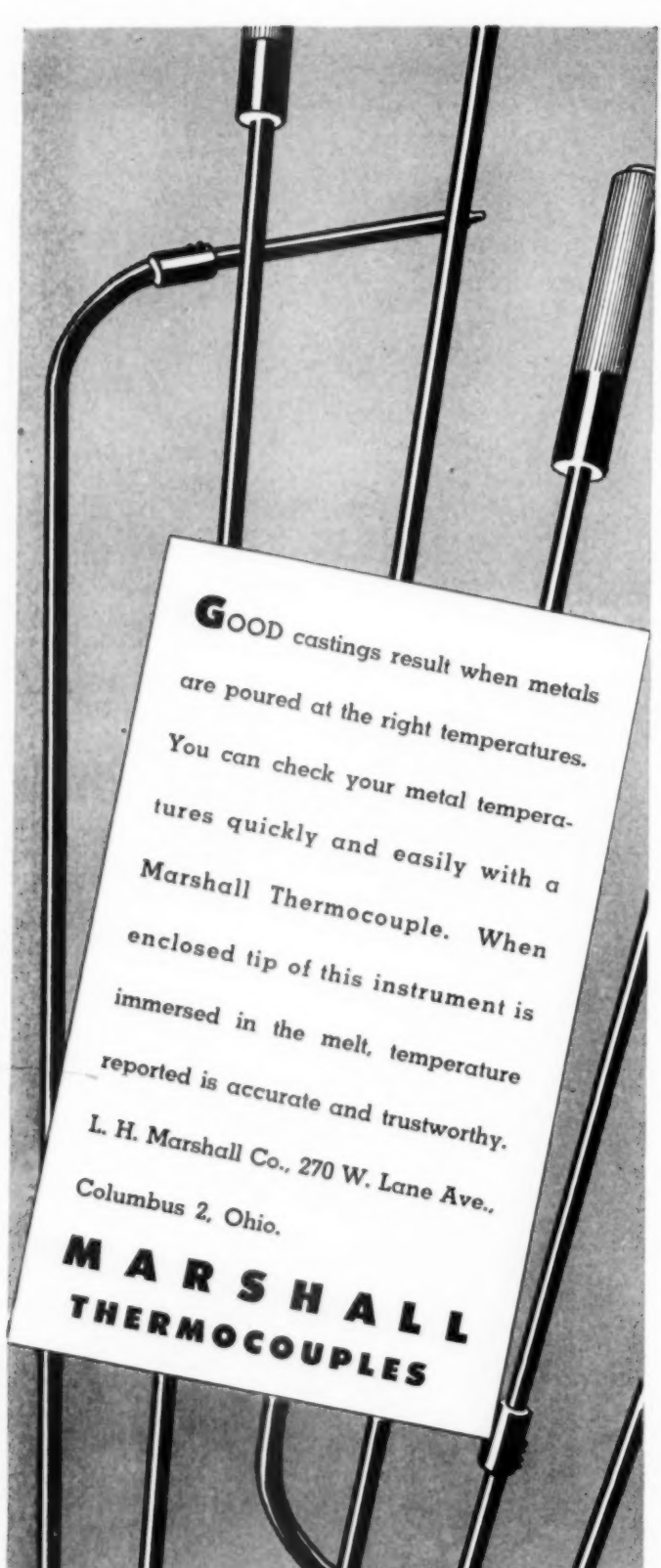
GOOD castings result when metals are poured at the right temperatures. You can check your metal temperatures quickly and easily with a Marshall Thermocouple. When enclosed tip of this instrument is immersed in the melt, temperature reported is accurate and trustworthy.
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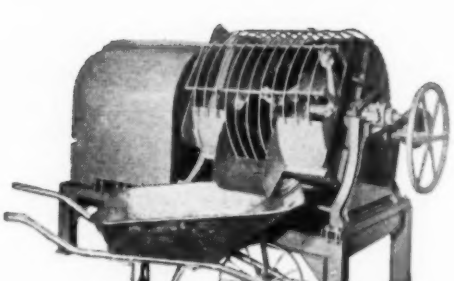

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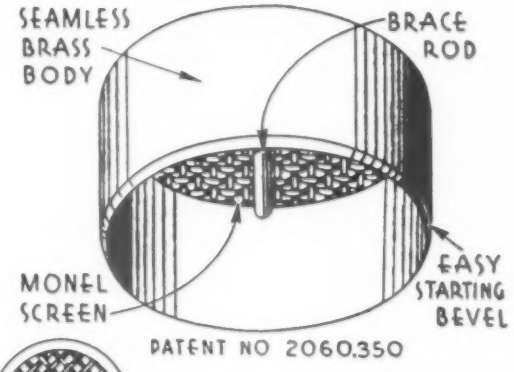

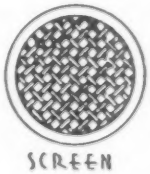
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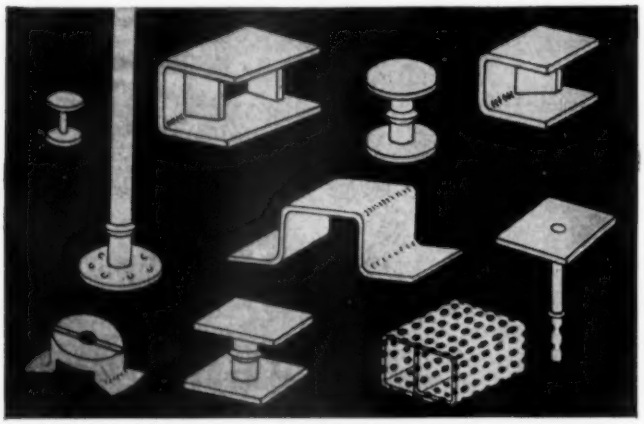

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HELPFUL LITERATURE

NOTE TO READERS: If you will check the item or items described which particularly interest you, we will be glad to request the manufacturers concerned to send you their literature. Use the attached postal card

1. Industrial Trucks

Clark Tructrator Div., Clark Equipment Co.—16-page illustrated broadside "Trucloader Method" describes Trucloader-fork lift truck having 1000-pound capacity. Truck is small enough to operate in loading area of highway trucks.

2. Magnetic Separators

Stearns Magnetic Mfg. Co.—24-page illustrated catalog No. 303 covers magnetic pulleys and pulley separators for wet and dry processes and standard induction types for separating concentration of ores, minerals, sands, powder and powdered materials.

3. Fuel Oil Burners

Dempsey Industrial Furnace Corp.—8-page illustrated bulletin No. 1 contains basic information on capacities and accessories for two series of industrial burners for handling fuels from kerosene to preheated bunker C oil.

4. Aluminum Alloy Castings

Acme Aluminum Alloys, Inc.—20-page illustrated brochure describes plant and laboratory facilities for production of more than 100 aluminum alloys as well as Triple-A Almag-55 magnesium alloy castings. Laboratory produced rare metals are also covered.

5. Generators

Century Electric Co. — 8-page illustrated catalog No. 18-1 deals with direct current generators for 50 watts to 200 kilowatts and alternating current generators for 500 watts to 150 kilowatts. Ratings, construction details and other data are included.

6. Unit Heaters

D. J. Murray Mfg. Co.—12-page illustrated catalog No. CUH-846-A covers line of cast iron grid unit heaters for operation on steam and water pressures of up to 250 pounds per square inch. Units resist corrosion. Specification tables cover data on forced circulation of water and motor horsepowers.

7. Industrial Materials

Hercules Powder Co.—20-page illustrated nontechnical booklet "A Trip Through Hercules Land" explains products utilized by twelve major industries. Industries covered are synthetic fiber, plastic, soap and disinfectant, insecticide, rubber, ink, construction, textile, paper and mining.

8. Flexible Shaft Machines

Wyzenbeek & Staff, Inc. — 16-page illustrated vest pocket size booklet No. AW-47 describes flexible shaft machines from 1/4 to 2 horsepower in size; high speed grinders from 1/8 to 1 horsepower; sanding drums, brushes, buffs, grinding wheels, cutters and allied equipment.

9. Chain Hoists

Reading Chain & Block Corp.—36-page illustrated catalog No. 60 gives complete data and prices of multiple gear, screw gear and differential chain hoists and trolleys. Comparison chart of types is included and information on selection of proper type is given. Strength tables of wooden timbers and steel beams are included.

10. Control Valves & Accessories

Foxboro Co.—36-page illustrated bulletin No. 277-1 shows various identifying enamel finishes corresponding with ASA code offered on Stabilflo valves. Specifications for control, needle type, poppet and butterfly valves are included. Information for computing valve sizes is presented.

11. Gas Carburizing Furnaces

Holcroft & Co. — 4-page illustrated folder "Gas Carburizing Furnaces for the Mass-Production Industries" describes controlled atmosphere process of carburizing and outlines advantages. Numerous furnace design features are listed.

12. Casting Materials

Foundry Services, Inc.—12-page publication "Fluxuations" No. 14 discusses permanent mold casting of aluminum, aluminum bronze, inoculation of gray iron and liquid shrinkage of castings. Foundry methods are discussed. Section of questions and answers offers aid to reader.

13. Steel Shop Equipment

Steel Factory Equipment Div. Cleveland Wire Spring Co.—36-page illustrated catalog No. 35 presents line of steel shop equipment including boxes, tool and kit boxes, handles and card pockets, shop trucks, lathe and chip pans, barrels, barrel trucks and cans, steel shelving, racks, lockers and bins, shop stools and special equipment.

14. Air Compressors

Kellogg Div., American Brake Shoe Co.—4-page illustrated bulletin entitled "On-the-Spot Air" discusses advantages of employing air compressors at points of use to reduce piping, air loss and operating costs. Plant survey is offered.

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15. Welding Technique

Ampco Metal, Inc.—16-page illustrated bulletin No. W-2A features welding with aluminum bronze electrodes by carbon and metallic arc methods. Weldability chart for copper base alloys and 33 bronze alloys is included.

16. Safety Guide

American Optical Co. — Illustrated safety guide classifies hazards by industries and recommends proper safety clothing and equipment for maximum protection from each hazard.

17. Power Belt Conveyor

Rapids-Standard Co. — 6-page illustrated folder "Your Man Friday" deals with Stevedore, Jr. power belt conveyor which features adjustable operating pitch of belt while in operation. Typical installations of units are covered and detailed specifications given.

18. Grinding Wheels

Mid-West Abrasive Co.—94-page illustrated booklet contains general information on grinding wheels. Crush form dressing, tool room grinding, centerless grinding of screw threads, specification data and chart of recommendations are included.

19. Industrial Ovens & Furnaces

Paul Maehler Co.—20-page illustrated bulletin No. 27 contains general data on line of ovens and furnaces and supplementary equipment. Technical information, design data and helpful tables are included. Air heater data also are given.

20. Air Motors

Bellows Senacon Co. — 8-page illustrated bulletin entitled "Versatile Controlled-Air Power" describes Bellows air motors, shows typical applications and gives information on dimensional data, advantages of use and standard and special stroke lengths available. Accessories are also described briefly.

21. Arc Welding

Harnischfeger Corp. — 16-page illustrated booklet entitled "Simplified Repair and Maintenance Welding" provides helpful data and information on welding technique and proper selection of suitable electrodes.

22. Electric Cable Hoists

Lisbon Hoist & Crane Co.—8-page illustrated bulletin describes line of Bob-Cat electric cable hoists. Design features, specifications, prices and other data are given. Cut-away drawings show mechanical features.

23. Abrasive Material

Norton Co.—4-page illustrated bulletin No. 10-46 reveals development and uses of 32 Alundum abrasive. Surface grinding, wheels for internal grinding and use of Alundum in foundries are covered.

24. Heat Treat Furnaces

Eclipse Fuel Engineering Co.—8-page illustrated bulletin No. D-9-12-45 covers line of Rotair recirculating air-draw furnaces that are gas fired and especially designed for heat-treating below 1250 F.

25. Blast Cleaning Equipment

Pangborn Corp. — 24-page illustrated booklet No. 2120-5-0144 describes numerous special installations of Roto-blast Airblast equipment for specific applications. Complete line of blast cleaning and dust control equipment is described briefly.

26. Industrial Furnaces

Dempsey Industrial Furnace Corp. — 8-page illustrated bulletin No. 3-1A23 charts capacities of oil or gas fired box and pot type industrial furnaces. Automatic temperature control, doors at both charge and discharge ends, upper and lower burners, roller rail hearth, full muffle construction and atmospheric generators can be supplied with each furnace.

27. Meters

Badger Meter Mfg Co.—66-page book entitled "All Out for War, All Set for Peace" is pictorial story of company's war production and facilities for peacetime manufacture of water meters and other meter products. Scores of precision operations are shown.

28. Testing Equipment

Steel City Testing Laboratory—Series of illustrated bulletins describes line of Brinell hardness testing equipment and ductility testing machine. Both portable and stationary types are covered.

29. Gearshift Drives

Lima Electric Motor Co.—6-page illustrated folder "Gearshift Drives for Greater Machine Tool and Plant Layout Flexibility" describes advantages of providing each tool with individual power source. Drives covered range from 1/2 to 20 horsepower.

30. Metallic-Concrete Floor

Master Builders Co. — 16-page illustrated bulletin entitled "The Masterplate Metallic-Concrete Floor" for new floors and resurfacing of old floors incorporates surface of cement and iron particles. Advantages of use, methods of laying and comparative data on installations are given.

31. Dust Collectors

Goergen-Mackwirth Engineering Co.—8-page illustrated bulletin presents data and information on Goergen-Mackwirth cyclone separators and Morse rarefied dust collectors for all types of industrial applications. Specification data are given.

32. Soda Ash

Solvay Sales Corp.—64-page bulletin No. 5 presents information relative to properties, shipments, storage, conveying, feeding, proportioning and elevating of bags and barrels of soda ash.

33. Communications Systems

Talk-A-Phone Co.—12-page illustrated catalog "Talk-A-Phone Has Everything" presents details of Special Deluxe line of intercommunications systems for industrial applications. Voice range, speakers, selection switches and cabinet designs are covered. Operation is on 110-115-volt alternating or direct current.

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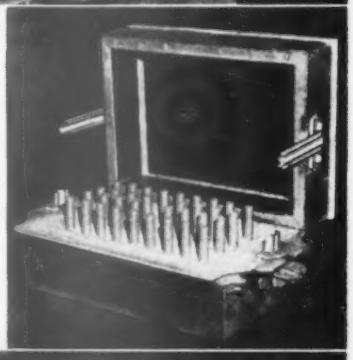

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We also make Square Head Chaplets, Stem and Double Head Chaplets.

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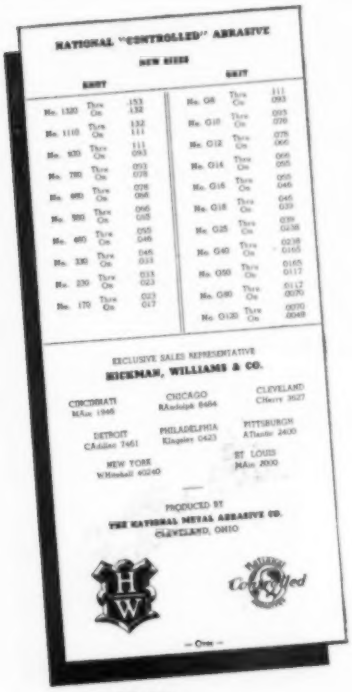
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The handy chart illustrated at the left shows size limits on shot and grit, handy hints on blast cleaning operations. Arranged for quick, easy reference. Write for your copy.

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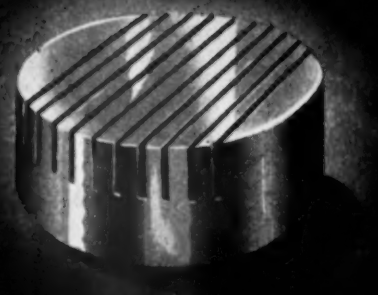

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Here's part of a complete line of DEMMLER core box vents—rigidly constructed in varying sizes of slotted brass—slotted steel—and screen mesh. Orders filled promptly from stock!

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Slot widths: .010", .013", .018"
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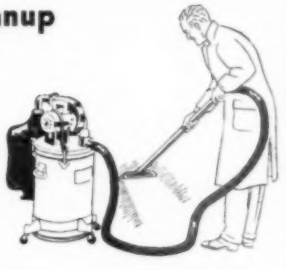

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TORNADO cleans out castings, cleans floors, walls, ceilings, equipment—in less time, with less effort, and at a cost of less than 3c an hour to operate. *Investigate.*

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Quandt Core Oil is a unique binder that can help you cut baking time and fuel cost 30% to 60%. It is unusually free from gas, smoke, or fumes; may be used safely with finest grain sand; does not creep or migrate; assures sound, true castings of uniformly excellent finish.

Descriptive Bulletin 453 on Quandt Core Oil and Quandt Core and Mold Wash will be sent upon request.

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We recommend Soffel's Permanent Mold Coating for aluminum; Klen-Zinc Flux for zinc base alloys; and Soffel's Die Coating for zinc base Die Castings. These materials produce better color on castings, and reduce shrink cracks. Liberal samples furnished without obligation on request.

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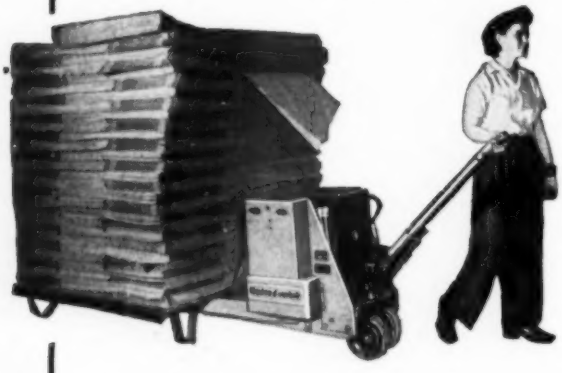

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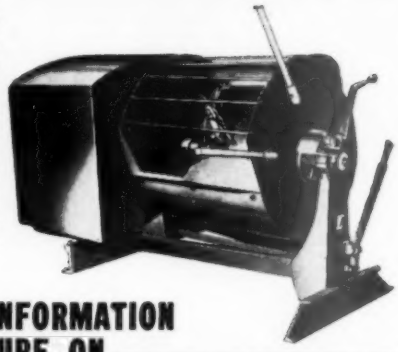

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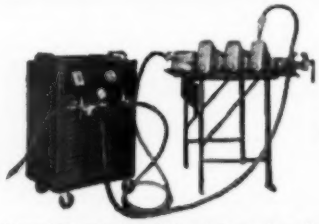

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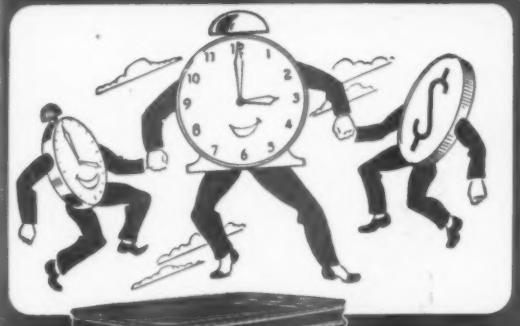

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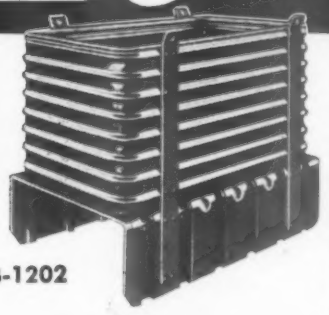

PB-1202

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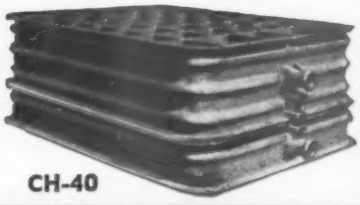
OM-1



CH-40

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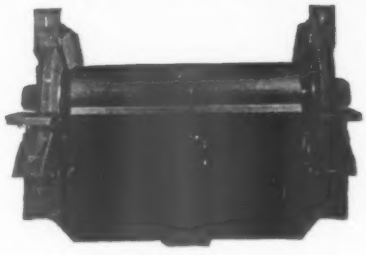
FOR MAXIMUM

METAL REMOVAL



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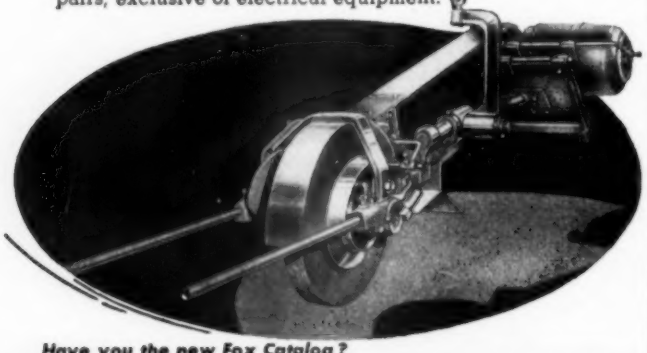

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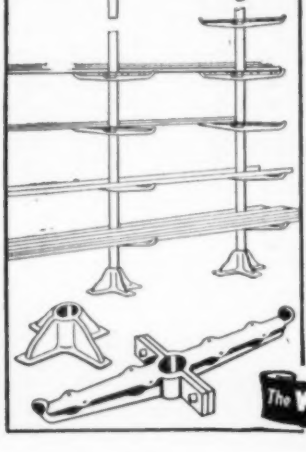

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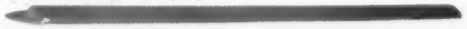

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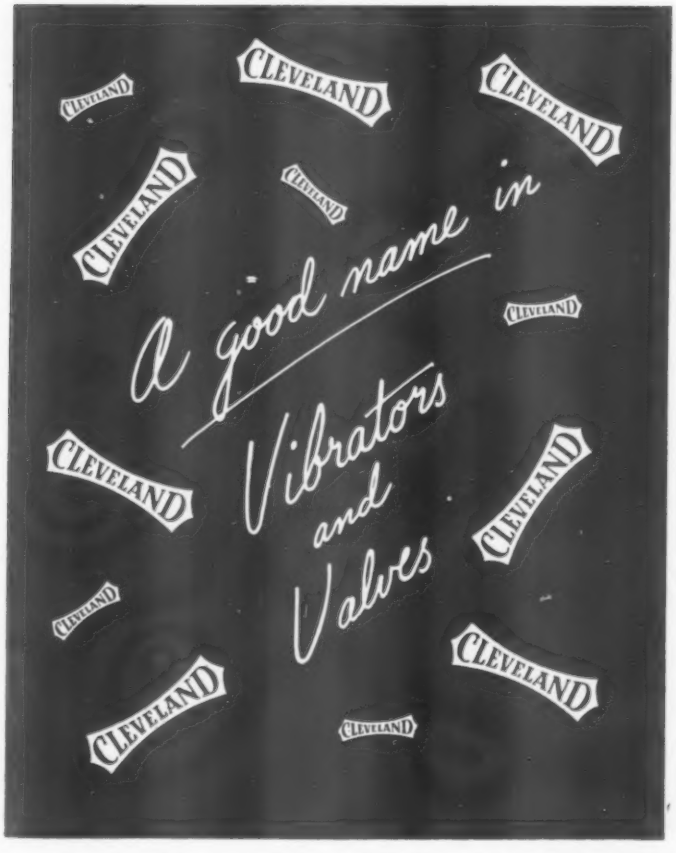

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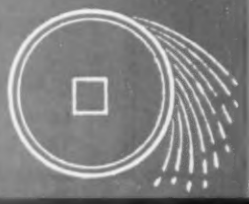

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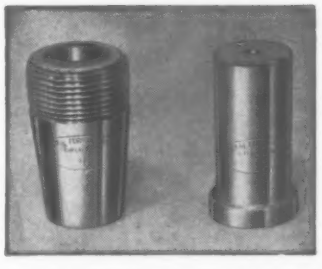

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Fen Machine Co., 1350 Babbitt Rd., Cleveland 17, Ohio.
Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
Johnston Mfg. Co., Minneapolis 13, Minn.
Loftus Engineering Corp., 610 Smithfield St., Pittsburgh 22, Pa.
R-S Products Corp., 4530 Germantown Ave., Philadelphia 44, Pa.

FURNACES (Gas or Oil Fired) (cont'd)

Stroman Furnace & Engineering Co., 300 W. Adams St., Chicago 6, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

FURNACES (Gray Iron Melting)

American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Heat Treating)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Bellevue Industrial Furnace Co., 2975 Bellevue Ave., Detroit 7, Mich.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Electric Furnace Co., W. Wilson St., Salem, Ohio.
Johnston Mfg. Co., Minneapolis 13, Minn.
Lanly Company, 750 Prospect Ave., Cleveland 15, Ohio.
Loftus Engineering Corp., 610 Smithfield St., Pittsburgh 22, Pa.
Maehler, Paul, Co., 2200 W. Lake St., Chicago 12, Ill.
R-S Products Corp., 4530 Germantown Ave., Philadelphia 44, Pa.

FURNACES, HEAT TREATING (Electric)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Ajax Electrothermic Corp., Trenton, N. J.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., W. Wilson St., Salem, Ohio.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FURNACES (Malleable Annealing)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Electric Furnace Co., W. Wilson St., Salem, Ohio.
General Electric Co., Schenectady, N. Y.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.
Young Brothers Co., 6508 Mack Ave., Detroit 7, Mich.

FURNACES (Malleable Melting)

American Bridge Co., Pittsburgh 19, Pa.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Nonferrous Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
Bellevue Industrial Furnace Co., 2975 Bellevue Ave., Detroit 7, Mich.
Campbell-Hausfeld Co., 300-320 Moore St., Harrison, O.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Fen Machine Co., 1350 Babbitt Rd., Cleveland 17, Ohio.
Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
Johnston Mfg. Co., Minneapolis 13, Minn.
Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, Ohio.

FURNACES (Nonferrous Melting) (cont'd)

Stroman Furnace & Engineering Co., 300 W. Adams St., Chicago 6, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Powdered Coal)

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Steel Melting)

Ajax Electrothermic Corp., Trenton, N. J.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

FURNACE BLOWERS

Campbell-Hausfeld Co., Harrison, O.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Joy Mfg. Co., La-Del Division, New Philadelphia, Ohio.
Roots-Connersville Blower Corp., Connersville, Ind.

FURNACE LININGS

Campbell-Hausfeld Co., Harrison, O.
Carborundum Co., Perth Amboy, N. J.
Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.
Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Johnson Fuller Co., 1366 So. Flower St., Los Angeles 15, California.
Ironton Fire Brick Co., Ironton, O.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Nock Firebrick Co., 1243 East 55th St., Cleveland 14, Ohio.
Stroman Furnace & Engineering Co., 300 W. Adams St., Chicago 6, Ill.
United States Graphite Co., Saginaw, Mich.

GAGES

Acme Aluminum Alloys Co. Inc., 232 N. Findlay St., Dayton 3, O.

GAGGERS

Federal Foundry Supply Co., 4600 E. 71st., Cleveland 5, O.

GAS

American Gas Association, 420 Lexington Ave., New York 17, N. Y.

GAS (Oxygen, Acetylene, Industrial)

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

GAS BURNERS

Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
North American Mfg. Co., 2910 E. 75th St., Cleveland 4, O.

GLOVES (Industrial, Safety)

American Optical Co., Southbridge, Mass.

GLUE POTS (Electric)

Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, O.

GOGGLES and EYE PROTECTORS

American Optical Co., Southbridge, Mass.
Chicago Eye Shield Co., 2300 West Warren, Chicago 12, Ill.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.
Wilson Products Inc., Reading, Pa.

GRAPHITE

Asbury Graphite Mills, Asbury, N. J.
Bloomsbury Graphite Co., Bloomsbury, N. J.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
International Graphite & Electrode Corp., St. Marys, Pa.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St., New York 17.
United States Graphite Co., Saginaw, Mich.

GRINDERS (Electric Portable)

Chicago Pneumatic Tool Co., General Offices: 8 East 44th St., New York 17, N. Y.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
U. S. Electrical Tool Co., Cincinnati 4, O.

GRINDERS (Flexible Shaft)

Mall Tool Co., 7720 South Chicago Ave., Chicago 19, Ill.
N. A. Strand Co., 5001 N. Wolcott Ave., Chicago 40, Ill.

GRINDERS (Pneumatic Portable)

Chicago Pneumatic Tool Co., General Offices: 8 East 44th St., New York 17.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.

GRINDERS (Surface, Bench, Disc, Floor)

Delta Mfg. Co., 620 E. Vienna Ave., Milwaukee 1, Wis.
Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, O.
Mall Tool Co., 7720 South Chicago Ave., Chicago 19, Ill.
N. A. Strand Co., 5001 N. Wolcott Ave., Chicago 40, Ill.
U. S. Electrical Tool Co., Cincinnati 4, O.
Vonnegut Moulder Corp., 1815 Madison Ave., Indianapolis 2, Ind.

GRINDERS (Swing Frame)

Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.
Mall Tool Co., 7720 South Chicago Ave., Chicago 19, Ill.
Sutter Products Co., Dearborn, Mich.
Vonnegut Moulder Corp., 1815 Madison Ave., Indianapolis 2, Ind.

GRINDING WHEELS—See ABRASIVE WHEELS

GRINDING WHEEL DRESSERS

Carborundum Co., Niagara Falls, N. Y.
Desmond-Stephan Mfg. Co., Urbana, O.
Western Tool & Mfg. Co., Springfield, Ohio.

GRINDSTONES

Bay State Abrasive Products Co., Westboro, Mass.
Sterling Grinding Wheel Div. Cleveland Quarries Co.,

GRIT (Abrasive)

Alloy Metal Abrasive Co., Ann Arbor, Mich.
American Steel Abrasives Co., Galion, O.
American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Carborundum Co., Niagara Falls, N. Y.
Clayton Sherman Abrasives Co., 3896 Lonyo Rd., Detroit 10, Michigan.
Globe Steel Abrasive Co., Mansfield, O.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.

GRIT (Abrasive) (Cont'd.)

National Metal Abrasive Co., 3560 Norton Ave., Cleveland 7, O.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.

HAMMERS (Chipping)

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Chicago Pneumatic Tool Co., General Offices: 8 East 44th St., New York 17.
Dayton Pneumatic Tool Co., Dayton 1, Ohio.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Schramm Inc., West Chester, Pa.

HARDNESS TESTING EQUIPMENT

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

HEAT CONTROL AND RECORDING DEVICES

Foxboro Company, Foxboro, Mass.
Illinois Testing Laboratories, 418 N. LaSalle St., Chicago 10, Ill.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.

HEATERS (Direct Fired)

Despatch Oven Co., Minneapolis 14, Minn.
Lanly Co., 750 Prospect Ave., Cleveland 15, Ohio.

HEATERS (Gas, Oil, Electric)

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Despatch Oven Co., Minneapolis 14, Minn.
Gehnrich Oven Div., W. S. Rockwell Co., 56 Church St., New York 7, N. Y.
Lanly Co., 750 Prospect Ave., Cleveland 15, Ohio.

HEATERS (High Frequency Electric)

Ajax Electrothermic Corp., Trenton, N. J.

HEATERS (Indirect Fired)

Despatch Oven Co., Minneapolis 14, Minn.

HEATERS (Liquid, Steam)

Johnson Corporation, Three Rivers, Mich.

HEATERS (Space, Unit, Direct Fired)

Dravo Corp., Neville Island, Pittsburgh 25, Pa.

HEATERS (Space, Unit, Oven, Water)

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Maehler, Paul, Co., 2200 W. Lake St., Chicago 12, Ill.
Sturtevant Co., B. F., Div. of Westinghouse Electric Co., Hyde Park, Boston, Mass.

HELMETS (Blasting)

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
American Optical Co., Southbridge, Mass.
Mine Safety Appliance Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa.
Pangborn Corp., Hagerstown, Md.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, O.

HELMETS (Welding)

American Optical Co., Southbridge, Mass.

HOISTS (Air)
Chicago Pneumatic Tool Co., General Offices: 8 East 44th St., New York 17.
Curtis Pneumatic Machinery Co., 1922 Kienlen Ave., St. Louis 20, Mo.
Gardner-Denver Co., Gardner Drive, Quincy, Ill.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.

HOISTS (Chain)
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Reading Chain & Block Corp., 2108 Adams St., Reading, Pa.
Wright Mfg. Div., American Chain & Cable Co., York, Pa.

HOISTS (Electric)
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee 14, Wis.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Modern Equipment Co., Port Washington, Wis.
Reading Chain & Block Corp., 2108 Adams St., Reading, Pa.
Shepard-Niles Crane & Hoist Corp., 360 Schuyler Ave., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.
Wright Mfg. Div., American Chain & Cable Co., York, Pa.

HOISTS (Hand)
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Clipper Mfg. Co., 2800 Warwick St., St. Louis, Mo.

HOSE (Air, Blasting, Water, Gas)
Gardner-Denver Co., Gardner Drive, Quincy, Ill.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Pangborn Corp., Hagerstown, Md.
Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N. J.
Schramm Inc., West Chester, Pa.

HYDRAULIC CLEANING EQUIPMENT
Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Ill.
Pangborn Corp., Hagerstown, Md.
N. Ransohoff, Inc., 208 W. 71st St., Cincinnati 16, O.

ILLUMINATORS (X-Ray Film)
Eastman Kodak Co., Rochester, N. Y.

IMPREGNATING SYSTEMS
Empire Varnish Co., 2636 E. 76th St., Cleveland 4, O.

INGOT MOLDS
Acme Foundry Co., Detroit 16, Mich.

INGOTS (Nonferrous)
Ajax Metal Co., Philadelphia 23, Pa.
Aluminum Company of America, Pittsburgh, Pa.
Aluminum & Magnesium Inc., Sandusky, O.
American Smelting & Refining Co., 120 Broadway, New York 5.
Apex Smelting Co., Chicago, Ill.
Cleveland Electro Metals Co., W. 38th St. & NP RR. Cleveland 13, O.
Federated Metals Div., American Smelting & Ref. Co., New York 5.
General Smelting Co., Philadelphia, Pa.
International Nickel Co., Inc., 67 Wall St., New York City 5.
Jobbins, Wm. F., Inc., Aurora, Ill.
Lavin & Sons R., Inc., Chicago, Ill.

INGOTS (Nonferrous) (cont'd)
National Smelting Co., Cleveland, O.
Niagara Falls Smelting & Refining Corp., 2204 Elmwood Ave., Buffalo 17, New York.
Silverstein & Pinsof, Inc., 1720 N. Elston, Chicago 22, Ill.
Sonken-Galamba Corp., Kansas City, Kan.
U. S. Metals Refining Co., New York.
U. S. Reduction Co., E. Chicago, Ind.

INJECTION MOLDING MACHINES
Lester-Phoenix Inc., 2711 Church St. Cleveland 13, Ohio.

INSPECTION (Cast Metals)
Magnaflux Corporation, 5910 Northwest Highway, Chicago 31, Ill.

INSPECTION (Fluorescent Penetrant)
Magnaflux Corporation, 5910 Northwest Highway, Chicago 31, Ill.

INSPECTION (Magnetic Particle)
Magnaflux Corporation, 5910 Northwest Highway, Chicago 31, Ill.

INSULATORS (for casting heads)
Houghton Co., E. F., Philadelphia, Pa.

IRON CEMENT
Smooth-On Mfg. Co., 570 Communipaw Ave., Jersey City 4, N. J.

IRON ORE
Bethlehem Steel Co., Bethlehem, Pa.
Pickands, Mather & Co., Cleveland 14, O.

IRON OXIDES
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Delta Oil Products Co., Milwaukee 9, Wis.

JACKETS (Mold)
Adams Co., Dubuque, Iowa.
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

LABORATORY EQUIPMENT (Chemical)
Buehler, Ltd., 228 N. LaSalle St., Chicago 1, Ill.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

LABORATORY EQUIPMENT (Physical)
Buehler, Ltd., 228 N. LaSalle St., Chicago 1, Ill.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Norton Co., Worcester 6, Mass.

LADLES
Bethlehem Steel Co., Bethlehem, Pa.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
Industrial Equipment Co., Minster, O.
Modern Equipment Co., Port Washington, Wis.
Frederic B. Stevens, Inc., Detroit 26, Mich.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

LADLE HEATERS
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

LADLE LININGS
Ironton Fire Brick Co., Ironton, Ohio.
Nock Firebrick Co. 1243 East 55th St., Cleveland 14, Ohio.

LATHE CENTERS
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

LEAD
American Smelting & Refining Co., 120 Broadway, New York 5.

LIMESTONE
Bethlehem Steel Co., Bethlehem, Pa.

LOADERS
Clearfield Machine Co., Clearfield, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

LUBRICANTS (Industrial)
Houghton Co., E. F., Philadelphia, Pa.
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.
Swan-Finch Oil Corp., R. C. A. Bldg., West, New York 26, N. Y.
United States Graphite Co., Saginaw, Mich.

LUMBER (All kinds)
Dougherty Lumber Co., 4300 East 68th St., Cleveland 5, O.

MACHINE KEYS
Standard Horse Nail Corp., New Brighton, Pa.

MAGNESIUM (Ingots)
Apex Smelting Co., 2534 Filmore St., Chicago 12, Ill.

MAGNET CONTROLLERS
Ohio Electric Mfg. Co., 5906 Maurice Ave., Cleveland, Ohio.
Power Plants Inc., 1755 E. 33rd St. Cleveland 14, Ohio.

MAGNETS
Dings Magnetic Separator Co., 4740 W. McGeough, Milwaukee 7, Wis.
Ohio Electric Mfg. Co., 5906 Maurice Ave., Cleveland, Ohio.
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

MANGANESE (Briquets)
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.

MATCHPLATES
Acme Aluminum Alloys Inc., 232 N. Findlay St., Dayton 3, O.
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
City Pattern Foundry & Machine Co., 1161 Harper Ave., Detroit 11, Mich.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.
Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, O.
Plaster Process Castings Co., 6922 Carnegie Ave., Cleveland 3, O.
Scientific Cast Products Corp., 1388-92 E. 40th St., Cleveland 3, O.

MECHANICAL ENGINEERS
Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.

MELTING POTS
Acme Foundry Co., Detroit 16, Mich.

METAL CLEANING EQUIPMENT
American Foundry Equipment Co., Mishawaka, Ind.
N. Ransohoff, Inc., 208 W. 71st St., Cincinnati 16, O.

METALLOGRAPHIC EQUIPMENT
Buehler Ltd., 228 N. LaSalle St., Chicago 1, Ill.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

METALLURGISTS
Associated Engineers Inc., 230 E. Berry St., Fort Wayne 2, Ind.
Crobough Co., Frank L., Blackstone Bldg., Cleveland, Ohio.
W. G. Reichert Engineering Co., 1060 Broad St., Newark, N. J.

METERS (Gas, Air, Water)
Illinois Testing Laboratories, Inc., 420 N. LaSalle St., Chicago 10, Ill.
Roots-Connersville Blower Corp., Connersville, Ind.

MICROSCOPES
Buehler, Ltd., 228 N. LaSalle, Chicago 1, Ill.

MIXERS (Core Wash)
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

MIXERS (Sand and Clay)
American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Blystone Division, Standard Sand & Machine Co., 549 W. Washington St., Chicago 6, Ill.
Clearfield Machine Co., Clearfield, Pa.
Construction Machinery Co., Waterloo, Iowa.
Freeman Supply Co., 1152 Broadway Toledo 5, O.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Royer Foundry & Machine Co., Kingston, Pa.

MOLD CONVEYORS
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
Roto-Cast Foundry Equipment Inc., 100 Grand St., Coldwater, Mich.

MOLD DRYERS
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Porbeck Mfg. Co., 2600 N. 9th St., St. Louis, Mo.

MOLD OVENS and DRYERS
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., Cleveland 13, O.
Gehnrich Oven Div., W. S. Rockwell Co., 56 Church St., New York 7, N. Y.
Lanly Company, 750 Prospect Ave., Cleveland 15, O.
Maehler, Paul, Co., 2200 W. Lake St., Chicago 12, Ill.
Porbeck Mfg. Co., 2600 N. 9th St., St. Louis, Mo.
Young Bros. Co., 6508 Mack Ave., Detroit 7, Mich.

MOLD TRUCKS (Power Operated)
Clark Tructractor Div. of Clark Equipment Co., Battle Creek, Mich.

MOLDERS' BENCHES
Western Tool & Mfg. Co., Springfield, Ohio.

MOLDING MACHINES
Adams Co., Dubuque, Iowa.
Arcade Manufacturing Div. Rockwell Mfg. Co., Freeport, Ill.
Beardsley & Piper Co., The, 2424 N. Cicero, Chicago 39, Ill.
Berkshire Mfg. Co., 1111 Power Ave., Cleveland 14, O.
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Fellows Corp., 1012 N. Third St., Milwaukee, Wis.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

MOLDING MACHINES (cont'd)

International Molding Machine Co., 2608 W. 16th St., Chicago 8, Ill.
Johnston & Jennings Co., 867 Addison Rd., Cleveland 14, O.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee 4, Wis.
Moline Iron Works, 228 Second St., Moline, Ill.
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
Pioneer Mfg. Co., West Allis, Wis.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

MOLDING MACHINES (Jolt)

Adams Co., Dubuque, Iowa.
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., 2608 W. 16th St., Chicago 8, Ill.
Johnston & Jennings Co., 867 Addison Rd., Cleveland 14, O.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee 4, Wis.
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.

MOLDING MACHINES (Rollover)

Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., 2608 W. 16th St., Chicago 8, Ill.
Johnston & Jennings Co., 867 Addison Rd., Cleveland 14, O.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee 4, Wis.
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Sutter Products Co., Dearborn, Mich.

MOLDING MACHINES (Squeeze)

Acme Aluminum Alloys Inc., 232 N. Findlay St., Dayton 3, O.
Adams Co., Dubuque, Iowa.
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., 2608 W. 16th St., Chicago 8, Ill.
Johnston & Jennings Co., 867 Addison Rd., Cleveland 14, O.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee 4, Wis.
Moline Iron Works, 228 Second St., Moline, Ill.
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.

MOLDING SANDS

Great Lakes Foundry Sand Co., United Artists Bldg., Detroit 26, Mich.
Ottawa Silica Co., Ottawa, Ill.
Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.
Wedron Silica Co., 38 So. Dearborn St., Chicago, Ill.

MOLD WASH

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
National Carbon Co., Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
United States Graphite Co., Saginaw, Mich.

MOLYBDENUM

Molybdenum Corporation of America, Pittsburgh 19, Pa.

MONORAIL SYSTEMS

American Monorail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Modern Equipment Co., Port Washington, Wis.

MOTOR CONTROL

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MOTORS (Electric)

Allis-Chalmers Mfg. Co., 1128 S. 70th St., Milwaukee 1, Wis.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

NAILS (Chill)

Bethlehem Steel Co., Bethlehem, Pa.
Capewell Mfg. Co., Hartford, Conn.
Republic Steel Corp., Cleveland 4, O.
Standard Horse Nail Corp., New Brighton, Pa.

NICKEL

International Nickel Co., Inc., 67 Wall St., New York City 5.

NOZZLES (Blasting)

Alloy Metal Abrasives Co., 311 W. Huron St., Ann Arbor, Mich.
American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Davenport Machine & Foundry Co., Davenport, Iowa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
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Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
S. G. Taylor Chain Co., Hammond, Ind.

SLIP JACKETS

Adams Co., Dubuque, Iowa.
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.

SMELTERS & REFINERS

American Smelting & Refining Co., 120 Broadway, New York 5.
Niagara Falls Smelting & Refining Corp., 2204 Elmwood Ave., Buffalo 17, N. Y.

SNAGGING WHEELS—See ABRASIVE WHEELS

SNAP FLASKS

Adams Co., Dubuque, Iowa.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.

SODA ASH

Mathieson Alkali Works, Inc., 60 E. 42nd St., New York 17, N. Y.

SOLDER

American Smelting & Refining Co., 120 Broadway, New York 5.

SPACE HEATERS

Dravo Corporation, Neville Island, Pittsburgh 25, Pa.

SPECIAL FOUNDRY ALLOYS

Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

SPIEGELEISEN

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.

SPRAY GUNS

Murphy & Co., Jas. A., Hamilton, O.
New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.

SPRUE CUTTERS

Adams Co., Dubuque, Iowa.
Freeman Supply Co., Toledo 5, O.
Milwaukee Chaplet & Mfg. Co., 1023 S. 40th St., Milwaukee, Wis.

STEEL (High Speed)
Bethlehem Steel Co., Bethlehem, Pa.

STEEL (Structural)
American Bridge Co., Pittsburgh 19, Pa.
Bethlehem Steel Co., Bethlehem, Pa.

STRIPPING MACHINES
Adams Co., Dubuque, Iowa.
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
International Molding Machine Co., 2608 W. 16th St., Chicago 8, Ill.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.

SURFACE TREATMENT METALS
N. Ransohoff, Inc., 208 W. 71st St., Cincinnati 16, O.

TAPER PINS
Standard Horse Nail Corp., New Brighton, Pa.

TEMPERATURE CONTROLLERS
Illinois Testing Laboratories, 418 N. LaSalle St., Chicago 10, Ill.
Marshall Co., L. H., 270 W. Lane Columbus 1, O.

TESTING LABORATORIES
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

TESTING (Non Destructive)
Magnaflux Corporation, 5910 Northwest Highway, Chicago 31, Ill.

THERMOCOUPLES
Illinois Testing Laboratories, 418 N. LaSalle St., Chicago 10, Ill.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.
Tamms Silica Co., 228 N. LaSalle St., Chicago 1, Ill.

TIERING MACHINES (Power)
Clark Tructractor Div. of Clark Equipment Co., Battle Creek, Mich.

TIMERS (Electric)
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

TIN
American Smelting & Refining Co., 120 Broadway, New York 5, N. Y.

TONGS
Industrial Equipment Co., Minster, O.

TOOLS (Pneumatic Portable)
Chicago Pneumatic Tool Co., General Offices: 8 East 44th St., New York 17, N. Y.
Dayton Pneumatic Tool Co., Dayton 1, O.
Gardner-Denver Co., Gardner Drive, Quincy, Ill.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Schramm Inc., West Chester, Pa.

TORCHES and BURNERS (Acetylene, gas, oil)
Freeman Supply Co., Toledo 5, O.
North American Mfg. Co., 2910 E. 75th St., Cleveland 4, O.

TRACTORS (Gas Powered)
Clark Tructractor Div. of Clark Equipment Co., Battle Creek, Mich.

TRAMRAIL SYSTEMS
American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.

TRAMRAIL SYSTEMS (Cont'd.)
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Modern Equipment Co., Port Washington, Wis.

TRAPS (Steam)
Johnson Corporation, Three Rivers, Mich.

TROLLEYS
Curtis Pneumatic Machinery Co., 1922 Kienlen Ave., St. Louis 20, Mo.
Modern Equipment Co., Port Washington, Wis.

TRUCKS (Electric-Industrial)
Automatic Transportation Co., 121 West 87th St., Chicago 20, Ill.
Lift Trucks Inc., 2425 Spring Grove Ave., Cincinnati 14, Ohio.

TRUCKS (Industrial)
Buda Company, Harvey, Ill.
Lift Trucks Inc., 2425 Spring Grove Ave., Cincinnati 14, Ohio.

TRUCKS (Motorized Hand Lift)
Automatic Transportation Co., 121 West 87th St., Chicago 20, Ill.

TRUCKS (Power Lift)
Automatic Transportation Co., 121 West 87th St., Chicago 20, Ill.
Clark Tructractor Div. of Clark Equipment Co., Battle Creek, Mich.
Lift Trucks Inc., 2425 Spring Grove Ave., Cincinnati 14, Ohio.

TRUCK WHEELS
Bethlehem Steel Co., Bethlehem, Pa.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

TUBES (Annealing)
Pressed Steel Co., Wilkes-Barre, Pa.

TUMBLING BARRELS
Cleveland Chaplet & Mfg. Co., 1197 West 67th St., Cleveland 2, O.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
N. Ransohoff Inc., 208 W. 71st St., Cincinnati 16, O.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

TURNTABLES
Beardsley & Piper Co., The 2424 No. Cicero, Chicago 39, Ill.
Modern Equipment Co., Port Washington, Wis.
Roto-Cast Foundry Equipment Inc., 100 Grand St., Coldwater, Mich.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

UNIT HEATERS
Dravo Corp., Neville Island, Pittsburgh 25, Pa.

VACUUM CLEANERS (Industrial)
Breuer Electric Mfg. Co., 5100 N. Ravenswood Ave., Chicago 40, Ill.

VALVES (Air, Water, Steam)
Air-Way Pump & Equipment Co., 405 S. Jefferson St., Chicago 7, Ill.
Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.
North American Mfg. Co., 2910 E. 75th St., Cleveland 4, O.
R-S Products Corp., 4530 Germantown Ave., Philadelphia 44, Pa.

VALVES (Adjustable Orifice)
North American Mfg. Co., 2910 E. 75th St., Cleveland 4, O.

VALVES (Blow-off and Cut-off)
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.
Wm. H. Nichols Co., Richmond Hill, Long Island 18, N. Y.

VENTILATING SYSTEMS
American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Joy Mfg. Co., La-Del Division, New Philadelphia, Ohio.
Pangborn Corp., Hagerstown, Md.
Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, O.
Sturtevant Co., B. F., Div. of Westinghouse Electric Co., Hyde Park, Boston, Mass.

VENTS (Core Box)
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Demmler & Bros., Wm., Kewanee, Ill.
Reinacker Industries, 2035 Hilton Rd., Ferndale, Mich.
Sinel Co., 1405 Philadelphia Drive, Dayton 6, O.
C. M. Smillie & Co., 1100 Woodward Hgts. Blvd., Ferndale, Mich.

VIBRATORS
Adams Co., Dubuque, Iowa.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Cannon Vibrator Co., 111 Power Ave., Cleveland 14, Ohio.
Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.
Davenport Machine & Foundry Co., Davenport, Iowa.
Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.
Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, O.
Link Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Martin Engineering Co., Kewanee, Ill.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee, Wis.
New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.
Nichols Co., Wm. H., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S P O Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Syntron Company, Homer City, Pa.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

VIBRATORS (Core Bench)
Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.

WARM AIR HEATERS
Dravo Corp., Neville Island, Pittsburgh 25, Pa.

WASH ROOM EQUIPMENT
Bradley Washfountain Co., 2217 W. Michigan St., Milwaukee, Wis.

WAX (Core, Vent, Pattern)
Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, Ohio.
PMS Co., 1701 Power Ave., Cleveland 14, O.
United Compound Co., Inc., 328 South Park Ave., Buffalo 4, N. Y.

WEDGES (Foundry)
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

WELDING GAS
Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

WELDING APPARATUS (Electric Arc)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee 14, Wis.
Metallizing Company of America, 1330 W. Congress St., Chicago 7, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

WELDING and CUTTING APPARATUS and SUPPLIES
Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

WELDING ELECTRODES (Carbon)
National Carbon Co., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.

WELDING RODS & ELECTRODES
Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.
Metallizing Company of America, 1330 W. Congress St., Chicago 7, Ill.

WHEELBARROWS
Construction Machinery Corp., Waterloo, Iowa.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

WHEELS, ABRASIVE (Cut-off)
Bay State Abrasive Products Co., Westboro, Mass.
Bridgeport Safety Emery Wheel Co. Inc., Bridgeport, Conn.
Carborundum Co., Perth Amboy, N. J.
Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.
General Grinding Wheel Corp., West Abrasives, Inc., Philadelphia 34, Pa.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Keystone Abrasive Wheel Co., Carnegie, Pa.
Raybestos Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J.
Mid West Abrasive Co., Detroit, Mich.
Norton Company, Worcester 6, Mass.
Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit, Mich.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Sterling Grinding Wheel Division, Cleveland Quarries Co., Tiffin, Ohio.

WHEELS (Wire)
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.

WIRE BRUSHES
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.

WIRE NAILS
Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Cleveland 4, O.

WOODWORKING MACHINERY
Delta Mfg. Co., 620 E. Vienna Ave., Milwaukee 1, Wis.
Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, Ohio.
Oliver Machinery Co., Grand Rapids 2, Mich.

X-RAY EQUIPMENT
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

X-RAY FILMS
Eastman Kodak Co., Rochester, N. Y.

X-RAY INSPECTION
Magnaflux Corporation, 5910 Northwest Highway, Chicago 41, Ill.

ZINC
American Smelting & Refining Co., 120 Broadway, New York 5, N. Y.

—When writing advertisers, please mention THE FOUNDRY—

Classified Advertising

Help Wanted

SALES REPRESENTATIVE

Now calling on non-ferrous foundries in the State of Ohio to represent manufacturer of Graphite Crucibles and Refractory Products on a commission basis. Write in detail advising products now handled, qualifications, etc.

BOX 967

THE FOUNDRY CLEVELAND 13, OHIO

FOUNDRY FOREMAN AND THREE ASSISTANT FOREMEN

We are in need of a Foundry Foreman and three Assistant Foremen for a large mechanical foundry producing railroad and miscellaneous iron castings, large and small. Foremen should be familiar with gating and rigging for production work. State experience and salary expected in first letter.

P.O. BOX 505
PITTSBURGH 30, PA.

FOUNDRY SUPERINTENDENT

Electric furnace steel foundry located in Midwest, 500 ton capacity. Give education, history, experience and salary expected.

BOX 113

THE FOUNDRY CLEVELAND 13,OHIO

PERMANENT MOLD DESIGNING ENGINEER

Must have at least 15 years' experience.

HAMPDEN BRASS & ALUMINUM CO.

SPRINGFIELD 1, MASS.

SAND SLINGER OPERATOR

Thoroughly experienced Sand Slinger Operator. Write stating past experience, age and when available. Good opportunity for the right type of man. Good wages and steady employment. Location Western Pennsylvania.

BOX 120

THE FOUNDRY CLEVELAND 13, OHIO

MELTING SUPERVISOR

Must be thoroughly experienced to take full charge of malleable duplex melting compartment. Metallurgical background essential. Splendid opportunity for man who can qualify. State complete qualifications. All correspondence strictly confidential.

BOX 141

THE FOUNDRY CLEVELAND 13, OHIO

GRAY IRON FOUNDRY SUPERINTENDENT

Experienced in production sand slingers, rollover continuous molding units, floor and jolt and squeeze molding. Large established company. Excellent opportunity for right man. State qualifications, age, salary expected and include photograph. Plant location Pennsylvania.

BOX 954

THE FOUNDRY CLEVELAND 13, OHIO

PERMANENT MOLD MEN

Permanent mold foundry in New York area desires to contact two men who are seeking excellent opportunities to build good futures for themselves by working with progressive growing organization, one as mold engineer and designer and one as foundry foreman. Must be able to assume full responsibilities of their respective positions. Replies held in strictest confidence. Address: Box 132, The FOUNDRY, Cleveland 13, Ohio.

Help Wanted

FOUNDRY FOREMAN

Experienced squeezer foreman having good knowledge of squeezer department work. Must know gating and risering of patterns for gray iron castings production shop. State age, experience, references and salary requirements. Address: Box 137, The FOUNDRY, Cleveland 13, Ohio.

WORKS MANAGER OR GENERAL FOUNDRY SUPERINTENDENT

For highest quality electric steel foundry producing small steel castings. Please state qualifications. Address: Box 123, The FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

For captive foundry about to be mechanized to produce 65—70 tons daily of grey iron and semi-steel light, medium and heavy castings on jolt squeeze, rollover, bench, floor and pit. Desire man with technical training, experienced in all foundry departments, who can build and maintain a good organization and consistently produce good castings economically. Address: Box 138, The FOUNDRY, Cleveland 13, Ohio.

CORE ROOM SUPERVISOR

For supervision in core room employing bench and machine core makers. Must have experience in supervising large force of employees working on production work for gray iron foundry. Thorough knowledge of core blowers and rollover machines essential. Write former experience stressing types of work handled, references and salary. Address: Box 136, The FOUNDRY, Cleveland 13, Ohio.

SALESMEN WANTED

In the following territories: New York, Pa., New Jersey, Del., Maryland and Conn. Augment your lines with one commodity line that is priced to sell and one equipment line with PROMPT delivery. In replying state territory covered, lines handled and experience. Straight commission basis. Address: Box 116, The FOUNDRY, Cleveland 13, Ohio.

MANUFACTURER'S AGENT

For southern and western Ohio now contacting foundries to represent nationally known line of electric melting furnaces for iron and bronze foundries. Write giving details on territory now covered, qualifications, companies represented, references, etc. Indiana territory also open. Address: Box 112, The FOUNDRY, Cleveland 13, Ohio.

ALUMINUM OPEN HEARTH OPERATOR

Secondary nonferrous refiners. Midwestern Region. State experience, qualifications, references and wages desired in first letter. Address: Box 867 The FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

For nonferrous foundry. Must know definitely all characteristics of bronzes and brasses, also centrifugal castings. State experience and salary. Address: Box 115, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERVISOR

Man to supervise production of cylinder heads and manifolds for gray iron foundry. Must have knowledge of sand control, molding, core making and pouring requirements on the production of these items. Write experience in detail listing education, companies worked for, type of product manufactured, salary requirements and date available. Address: Box 129, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Midwestern Grey Iron Foundry producing heavy Diesel engine and machinery castings requires experienced man with all operations, including estimating. State age, education and experience in detail. Address: Box 988, The FOUNDRY, Cleveland 13, Ohio.

PATTERN FOREMAN

Experienced wood and metal pattern maker for position as assistant foreman in department employing fifty mechanics. Excellent opportunity for man who can qualify. Established production foundry with heavy backlog of orders. Write stating qualifications and employment record. Address: Box 984, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY ENGINEER

With diversified experience in gray iron, skilled in modern foundry layout, plant design and mechanized methods; also tooling, machining and materials handling. Give full details regarding age, experience, etc. Address: Box 956, The FOUNDRY, Cleveland 13, Ohio.

Help Wanted

MALLEABLE IRON FOUNDRYMAN

LONG ESTABLISHED MALLEABLE IRON JOBBING FOUNDRY MAKING MEDIUM WORK HAS OPENING FOR EXPERIENCED MAN FAMILIAR WITH ALL OPERATIONS AND PARTICULARLY CUPOLA AND AIR FURNACE MELTING, MOLDING AND COREMAKING. SHOULD KNOW MODERN FOUNDRY EQUIPMENT AND AN ENGINEERING BACKGROUND IS DESIRABLE. A PERMANENT JOB WITH EXCELLENT PROSPECTS FOR THE RIGHT MAN WHO CAN SHOW A SUCCESSFUL RECORD AND IS AMBITIOUS. NO FLOATERS, PLEASE. ADDRESS BOX 109, THE FOUNDRY, CLEVELAND 13, OHIO.

SALES ENGINEER

Must have thorough experience on application of modern dust elimination equipment to foundry dust and ventilation problems. Submit information as to educational background, age, experience and salary desired.

BOX 125

THE FOUNDRY CLEVELAND 13, OHIO

BRASS FOUNDRY FOREMAN

Practical foundryman to take complete charge of foundry and core room. Brass and aluminum. Preferably some experience in plumbing line. In your application state age, experience, references and salary desired in first letter. Address: Box 119, The FOUNDRY, Cleveland 13, Ohio.

WANTED
SALESMEN or MANUFACTURERS' AGENTS

Now calling on foundries and forgings companies to handle complete line of Missouri refractories. Write in detail giving territories now covered, products handled, qualifications, etc. Address: Sales Manager, Chicago Fire Brick Company, 1467 Elston Ave., Chicago 22, Ill.

CORE ROOM FOREMAN

Must have knowledge of bench, rollover and core blower machines. Must have experience in production of gray iron foundry products. State age, education, experience in detail and salary requirements. Address: Box 134, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

For plumbing fixture foundry, using 2 Beardsley Slingers. In Pennsylvania, good opportunity. Give full particulars. Address Box 916, The FOUNDRY, Cleveland 13, Ohio.

ASSISTANT MANAGER SUPERINTENDENT

Foundry experience, business acumen necessary. Unusual opportunity. Old established concern. Address: Box 124, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

First class foundry sueprintendent for a foundry employing 300 men producing gray iron castings. Located in New Jersey. Write giving full particulars as to age, experience, references, etc. Address: Box 958, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

First class radiator foundry superintendent. Consideration will be given only to applicants with A-1 qualifications and having at least ten years' experience in this type of work. Give full information as to age, experience, etc. Address: Box 957, The FOUNDRY, Cleveland 13, Ohio.

BRASS FOUNDRY FOREMAN

A working foreman to assist Foundry Superintendent in a well equipped production brass foundry; good opportunity for a hustler. State age, experience and salary desired in first letter. Address: Box 192, The FOUNDRY, Cleveland 13, Ohio.

PATTERN ROOM SUPERVISOR

By foundry in Connecticut. Must have experience in wood and metal patternmaking, layout and general supervision. Write stating experience, approximate wages expected and other particulars. Address: Box 117, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON SUPERINTENDENT

Experienced gray iron superintendent, capable of taking complete charge of operations in modern, mechanized foundry. State full qualifications and salary expected in first letter. Excellent opportunity for aggressive, high grade man. Address: Box 133, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Help Wanted

BRASS OPEN HEARTH OPERATOR
Secondary nonferrous refiners. Midwestern Region. State experience, qualifications, references and wages desired in first letter. Address: Box 866, The FOUNDRY, Cleveland 13, Ohio.

YOUNG METALLURGIST
Good opportunity with Ohio manufacturer for young metallurgist in brass foundry. Give education, experience and salary expected. Address: Box 965, The FOUNDRY, Cleveland 13, Ohio.

EXPERIENCED CUPOLA MAN
Familiar with Kathabar Process in the manufacture of individual grey iron castings. Splendid opportunity with nationally known concern in Philadelphia area. Address: Box 983, The FOUNDRY, Cleveland 13, Ohio.

GENERAL PLANT SUPERINTENDENT
Experienced in gray iron foundry operations in medium sized foundry. Must have proved administrative ability and good record of organization and modern plant management. Must be able to supervise the production and be responsible for the successful operation of all departments including cupola, core room, jolts, sandslinger and cleaning room. Good opportunity for tactful, executive type of foundryman. Give in detail work experience, type of products manufactured, reference, education and salary. Address: Box 155, The FOUNDRY, Cleveland 13, Ohio.

MOLDING MACHINE SALESMAN
Experienced molding machine salesman between 30 and 40 years old. Travel half time. Salary. Write giving full qualifications and experience. Address: Box 150, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

EASTERN SALES REPRESENTATIVE FOUNDRY PRODUCTS
Technical graduate with approximately ten years foundry experience, all departments, molding, foundry methods, castings design, costs details, pattern design, gating, sales engineering, customer contacts, correspondence, research. Ferrous or nonferrous foundry making types of castings or diversified lines. Full time available if unusual opportunity. Address: Box 146, The FOUNDRY, Cleveland 13, Ohio.

YOUNG FOUNDRY EXECUTIVE
A practically trained foundryman, well versed in all phases of production and jobbing work, steel and high alloy. Thirteen years' experience with both small and large castings. Presently employed by Midwest Manufacturer but desires a more progressive employer. Engineering graduate, capable of handling any foundry assignment. Address: Box 147, The FOUNDRY, Cleveland 13, Ohio.

PATTERNMAKER FOREMAN
Metal and wood patternmaking, general line pattern work from molding machine cope and drag plates, core equipment and the general line of machine tool patterns with jig and fixture patterns. Estimate layout work, supervise making and checking patterns. First class mechanic, can take over working foreman job in small shop, teach apprentices and handle journeymen to show profit on work in your shop. Take over matchplate work including hard hand matchplates and plaster cast pressure plates or patterns. General experience both patternshop and foundry on pattern equipment. Address: Box 142, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY GENERAL MANAGER OR SUPERINTENDENT
Forty-five years of age. 28 years' practical experience from molder and melter to executive capacity in general jobbing, machine and production foundries. Good rigger on all phases of pattern and molding procedure. Want connection with reliable company that needs a man with my experience. Available January 1st. Address: Box 140, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRY EXECUTIVE
Technical education in metallurgy and business administration with an unusual practical background in all classes of light ond medium castings. Experienced in developing stable organizations for improved operations. Qualified record in maintaining excellent employee and customer relations. Address: Box 990, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

AVAILABLE
Foundry and industrial engineer, for modernization, mechanization, surveys, wage incentives, production controls, cost control in grey iron, malleable and steel, on consulting or short term contract basis. Address: Box 813, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN
Wants to make new connection. Practical experience with technical training and cost minded. Experienced with work ranging from a few pounds to ten ton. Good rigger for production. Understand gray iron metallurgy. Mix iron by analysis. A1 cupola supervision. Capable of handling a foundry organization as top management, assistant to a busy executive or as a foundry superintendent. Middle age. Good personality. Address Box 834, The FOUNDRY, Cleveland 13, Ohio.

DEMONSTRATOR OR SERVICE MAN AVAILABLE
High grade man desires to make a connection. Thirty years of foundry experience, technical background can help your sales of any type foundry material or equipment. Address: Box 143, The FOUNDRY, Cleveland 13, Ohio.

NONFERROUS FOUNDRY MANAGER OR SUPERINTENDENT
McLain Graduate of Milwaukee, Wis. Practical foundryman with many years' experience in aluminum, brass, copper bronze, aluminum bronze and magnesium bronze in jobbing or production in mechanized foundry setup. Understand foundry molding coreroom cutoff grinding and cleaning room and shipping room. A-1 foundryman in marine hardware and plumbing fixtures. Neat appearing and aggressive. Employed as foundry superintendent and engineer. Address: Box 974, The FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT-MANAGER
Practical high grade gray iron foundryman, age 47 technically trained, graduate metallurgist with broad background of experience from molder to superintendent producing quality work in general jobbing, machine tool, diesel motors and high production in both conventional and highly mechanized foundries. Well versed in cupola and sand control, core, rigging and gating, cleaning and working from blueprints. Would like to make connection with reliable firm needing the services of a high grade foundry man that will produce desired results. Must be located in New York or North Eastern states. Address: Box 127, The FOUNDRY, Cleveland 13, Ohio.

ASSISTANT SUPERINTENDENT NONFERROUS METALLURGIST
B. S. in metallurgical engineering. Three years' experience in foundry research involving foundry alloys, melting, gating, casting and testing. Desire position in development or production capacity. Middle West preferred. Address: Box 904, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN
Wants to make a connection with a concern where practical experience and technical training in modern production methods and good cupola practice are appreciated. Melt by analysis, iron, semi-steel, NI-RESIST, bronze and aluminum. Light, medium or heavy castings. Experienced on molding machines and core blowers. Good rigger. Twenty-six years as foundry superintendent. Middle age and good personality. Address: Box 122, The FOUNDRY, Cleveland 13, Ohio.

ALUMINUM PERMANENT MOLD ENGINEER
Twenty-seven years old with B.S. in Metallurgical Engineering degree. 5½ years' experience in aluminum permanent mold work. Experience includes physical testing, heat treating, quality control, metal control, mold operation and some mold design. Desires permanent position in small to medium sized reliable foundry, preferably in Ohio of Middle West region. Address: Box 110, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERVISION OR CHIEF METALLURGIST
Age 38, graduate degree. Highly recommended. Can produce results. Sound experience in steel, alloys, grey iron, nonferrous. Go anywhere. $500 minimum. Address: Box 998, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

WORKING FOREMAN
Experience 22 years as molder and foreman in jobbing shops on gray iron and brass, any alloy any size. Complete knowledge of cupola, coremaking, brass furnaces. Prefer small shop on West Coast. Age 37. Married. Address: Box 130, The FOUNDRY, Cleveland 13, Ohio.

CUPOLA FOREMAN
Available at once, many years' practical experience, prefer large concern operating several cuolas, guarantee excellent results on the most economical basis. Have metallurgical background. Address: Box 105, The FOUNDRY, Cleveland 13, Ohio.

NONFERROUS ASSISTANT SUPERINTENDENT
Experienced in sand, chill, centrifugal and plaster mold casting. Some permanent mold work. B. S. Metallurgical Engineering. Age 32. Have made important changes in setup of centrifugal casting machines. Address: Box 994, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY METALLURGIST
B. S. Metallurgical Engineering—6 years' experience as foundry metallurgist in charge of nonferrous and ferrous melting, sand control, heat treatment and research. Desire position as chief metallurgist, development or research metallurgist. Address: Box 992, THE FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT OR MANAGER
Capable, progressive gray iron foundryman with successful record as Foundry Superintendent, qualified to direct all foundry activities. Twenty-eight years' practical experience and technical knowledge, specializing in jobbing production of heavy machinery and diesel engine castings with proven ability developing and applying modern methods and scientific controls over all operations. Address: Box 126, The FOUNDRY, Cleveland 13, Ohio.

PRODUCTION MANAGER
Successful practical planner, 25 years' experience including sales, machine shop and foundry. Address: Box 111, The FOUNDRY, Cleveland 13, Ohio.

ASSISTANT SUPERINTENDENT METALLURGIST
Electric furnace steelmaking or foundry supervisory capacity. B. S. in Metallurgy. Wide experience in melting low and high alloy steels. Address: Box 118, The FOUNDRY, Cleveland 13, Ohio.

CAST IRON WELDING SPECIALIST
Desires connection with large organization. Will equip shop, train welders, guarantee successful operation. Prefer yearly contract. Address: Box 982, The FOUNDRY, Cleveland 13, Ohio.

YOUNG METALLURGICAL ENGINEER
Mechanical engineering degree with metallurgical experience—two years well ground experience in steel and cast iron metallurgy before entering Navy—at present shift foreman in nonferrous smelter—either ferrous or nonferrous position acceptable. Address: Box 135, The FOUNDRY, Cleveland 13, Ohio.

PATTERN FOREMAN
With 20 years' experience running shops. Fine working knowledge of foundry practice. Have been connected with steel, brass, aluminum and at present with grey iron foundry. Can estimate from blueprints. Jobbing or production work, wood and metal. Best references from past employers. Address: Box 923, The FOUNDRY, Cleveland 13, Ohio.

NONFERROUS ENGINEER
B.S. in chemical engineering—three years' experience in foundry research involving foundry metallurgy and chemical engineering principles. Desire development or production work. New England area preferred. Address: Box 946, The FOUNDRY, Cleveland 13, Ohio.

MALLEABLE OR GRAY IRON FOUNDRY FOREMAN
Eighteen years' practical experience in malleable and gray iron foundry from molder to general foreman. Expert on gating and feeding malleable iron. Age 35. Address: Box 154, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Positions Wanted

MELTER

With 20 years' experience on acid, basic and electric furnaces. Understand making of all alloy steel handling of ladles. Willing to go any place. Address: Box 962, The FOUNDRY, Cleveland 13, Ohio.

MALE INDUSTRIAL NURSE

Fifteen years' experience. Seeks position with a foundry company. Also experienced in personnel and office work. Willing go anywhere. Address: Box 144, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERVISOR

Graduate engineer—8 years' experience in molding, melting, supervision and plant maintenance. Jobbing and some production work, half pound to eight tons. Pit, floor, bench and jolt squeeze. Address: Box 103, The FOUNDRY, Cleveland 13, Ohio.

CUPOLA & FOUNDRY FOREMAN

Age 42. Health A-1. Twenty years' experience on gray iron and malleable cupolas. Able to figure own iron mixes. Also experience in the foundry and coreroom. Can furnish references. Address: Box 152, The FOUNDRY, Cleveland 13, Ohio.

SALES REPRESENTATIVE

With good following and contacts. Ferrous and nonferrous — sand — permanent and centrifugal castings. Michigan and Ohio. Address: Box 153, The FOUNDRY, Cleveland 13, Ohio.

Foundries For Sale

FOUNDRY FOR SALE

Where asthma sufferers find relief. 16,000 population. Ranching, mining, sawmill territory. Railroad and highway frontage. Thirty-six and twenty-six inch inside diameter cupolas and complete equipment. Sell equipment separately. Also business building with lovely two bedroom apartment above. Owner retiring. Address: Harry Marshall, Bashford Building, Prescott, Arizona.

FOR SALE

Small gray iron foundry, title building 50 x 120, all necessary equipment to produce 3 to 5 tons daily. Modern 6 room home with two acres ground also available. Will sell separate if desired. Address: Box 107, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

FOUNDRY—Well equipped and situated in progressive agricultural community. Includes building, land, business and a large number of standing orders for castings from manufacturers of agricultural equipment. $12,500 total price. $7,400 down, terms on balance. Address: Box 996, The FOUNDRY, Cleveland 13, Ohio.

Open Capacity

OPEN CAPACITY

Foundry has open capacity for light and medium weight grey iron castings. Location East Tennessee. Address: Box 131, The FOUNDRY, Cleveland 13, Ohio.

OPEN CAPACITY

For brass, bronze and aluminum castings. Address: Stephen Delmar, 18 Sunnyside Pl., Buffalo 7, N. Y.

OPEN CAPACITY

Have open capacity for bench work. Small and medium sized aluminum sand castings. Address: A. K. Mansfield Aluminum Foundry, 451 Daisy Street, Mansfield, Ohio.

Wanted-To-Buy

DO YOU WANT TO SELL

All or substantial interest in your foundry to an experienced capable foundry executive? Desired location Middle West. Address: Box 121, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Gas fired crucible furnace to melt aluminum. New or used. State price, condition and size. Address: Box 128, The FOUNDRY, Cleveland 13, Ohio.

Wanted-To-Buy

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address Box 578, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Monarch or U. S. melting furnace 2000 or 3000 pounds capacity. Forward particulars to Box 964, The FOUNDRY, Cleveland 13, Ohio.

WANTED

A small producing ferrous foundry in Ohio, Pennsylvania, West Virginia, Maryland or Virginia. Must be well equipped and preferably with small electric furnace though not necessary. Cash available and required for immediate operation. Address: Box 145, The FOUNDRY, Cleveland 13, Ohio.

WANTED

to buy at reasonable price. One used Royer, sand conditioner, with or without motor. Address: Box 108, The FOUNDRY, Cleveland 13, Ohio.

WANTED

1 Gas-fired stationary brass melting furnace for # 30 or # 40 crucible complete with blower and burner. Address: P. E. GUERIN, INC., 23 JANE ST., NEW YORK 14, N. Y.

WANTED

Large wood turning lathe. State price, size and condition. Address: Box 148, The FOUNDRY, Cleveland 13, Ohio.

WANTED

American airless wheelabrator. State size, age and price. Address: THE RELIABLE BARREL CO., STA. D.—BOX 319, CLEVELAND, OHIO.

SANDSLINGER

Motive or stationary type. Please give full details as to size and capacity, age, condition, motor equipment, price. Also SIMPSON #2 sand mixer. Address: Box 106, The FOUNDRY, Clevelan 13, Ohio.

WANTED

250 CFM air compressor, small cupola and blower, molding machines, core oven, pedestal grinders, ladles, hoists, snap flasks, jackets, charging buckets, cleaning and other small equipment. Address: Box 149, The FOUNDRY, Cleveland 13, Ohio.

Accounts Wanted

FACTORY REPRESENTATIVE

For a manufacturer of nonferrous and gray iron furnaces covering Northwestern states desires to obtain lines of foundry equipment suitable to go with same. Address: Box 114, The FOUNDRY, Cleveland 13, Ohio.

For Rent

WANTED FOR RENT

Small electric arc furnace, 10-40 lbs. charge with power supply for short experimental investigation, vicinity New York, Philadelphia. Address: Box 151, The FOUNDRY, 16 E. 43rd St., New York 17, N. Y.

Capacity Wanted

ALUMINUM CASTINGS

Foundry to make small aluminum castings. Steady year round work. Pressure match plates furnished. Address: STANLEY TOY CO., OCONTO, WIS.

Opportunities

OPPORTUNITY

Inventor wishes connection with progressive foundry, equipped or contemplating mechanized production. Indispensable plumbing fixture. Patented (300 lbs.), no machining. Builders, architects waiting. Over million net annually estimated. Address: Box 997, The FOUNDRY, 16 East 43rd St., New York, New York.

Opportunities

GOOD OPPORTUNITY

To have your own foundry business in "Hometown," USA, (Eastern New York); modern cement block and steel foundry, well equipped, plenty of orders for iron and bronze castings; ample capital available; for capable experienced foundry man who can produce good iron, bronze and aluminum castings efficiently, dependably and with lowest production costs. Address: Box 104, The FOUNDRY, Cleveland 13, Ohio.

OPPORTUNITY

We can furnish empty tight and slack wooden barrels also steel drums for your products. ADDRESS: BUCKEYE COOPERAGE STATION, C.P.O. BOX 1501, CLEVELAND, OHIO.

Employment Service

SALARIED POSITIONS
$2,500-$25,000

This thoroughly organized confidential service of 37 years' recognized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details.

R. W. BIXBY, INC.
101 Dun Bldg. Buffalo 2, N. Y.

For Sale

FOR SALE

OVERHEAD ELECTRIC TRAVELING CRANES

	TONS	MAKE	SPAN	CURRENT
(1)	10	Shaw Box	40'0"	220-VAC
(1)	10	Northern	60'0"	440-VAC
(1)	10	Champion	86'0"	440-VAC
(1)	15	Shaw	106'8"	230-VDC
(1)	125/25	Morgan	100'0"	230-VDC

ELECTRIC MONORAIL HOISTS

(1)—½-ton American LoHed 230-VDC.

(6)—½-ton Shepards, 230-VDC., 5-HP. motor HIGH SPEED, FL. OP., 30'0" lift.

(1)—1-ton Shepard 230-VDC., FL. OP.

SPECIAL: 7½-ton, 2-motor, cage operated, Shepard 230-VDC., 40'0" lift, enclosed for out door service, hoist 28/70-FPM., Trolley 400-FPM., an excellent hoist for scrap yard service or cupola charging.

ALL ABOVE IN STOCK OFFERED REBUILT & GUARANTEED.

SEND FOR OUR STOCK LIST OF A.C. & D.C. GENERAL PURPOSE, CRANES & MILL MOTORS, ELECTRIC BRAKES & CONTROL EQUIPMENT, MOTOR GENERATOR SETS, TRANSFORMERS, ETC., OF ALL SIZES.

T. B. MACCABE COMPANY
4300 CLARISSA ST.
PHILADELPHIA (40), PENNA.

FOR SALE

Brass and bronze cupola melting furnace complete with blower and accessories including smoke scrubber. Purchase includes our services on installation and operation with regular foundry coke.

LEIGHTON M. LONG & ASSOCIATES
604 NICHOLAS BUILDING
TOLEDO 4, OHIO

FOR SALE

One used Model "AS" centrifugal casting machine made by Centrifugal Casting Machine Co., Tulsa, Oklahoma, complete with motor and controls. Condition—excellent.

GEO. D. ROPER CORPORATION
ROCKFORD, ILLINOIS

Classified Advertising

For Sale

REBUILT EQUIPMENT

8 ton worm geared Ladle
(We also make new ladles)
1—3000 Worm Geared Ladle
1—5000 Worm Geared Ladle
2—2000 Worm Geared Ladle

CORE PLATES

250 each, new, ⅜" thick, steel, in the following sizes:

7½ x 10"	7½ x 18"
7½ x 12"	7½ x 20"
7½ x 14"	7½ x 22"
7½ x 16"	7½ x 24"

We also have the same as above in ¼" thick steel plates

MISCELLANEOUS MACHINES & EQUIPMENT

1—4 ft. Sand mixer, double wheel, motor and speed reducer
5 H motor mounted on base with mixer
1—Hoevel sand blast barrel, 30" x 36"
1—Automatic lift truck and charger
5—Burners
1—Gardner Air Compressor, 9 x 8 Motor & Tank & Belts
1—Hycycle Grinder
2—Scales (New) Toledo
2—5 Ton Chain Blocks (New)
2—1 Ton Chain Fall (New)

MISCELLANEOUS MACHINES & EQUIPMENT

1—Scleroscope
High speed motor & blower for brass furnaces, several different sizes
15—Skids for lift truck
90—Thompson adjustable clamps
Assortment of new emery wheels
Air grinders, portable
Air bench rammers
Air floor rammers
Air vibrators
Chipping hammers
Osborne Molding Machines #558
Core Racks—6' x 4' with 35 pipes to each rack.
Lyon-Raymond Hyd. Lift Truck, 2500# Cap. ea. Model CW-11-54
Air Hoists, 2000# Capacity, Size "C"
Air Hoists, 4000# Cap. Size "D"
Hand Trucks, #9272, Fairbanks
Lyon-Raymond Hyd. Lift, Cap. 2500# Model CW-11-54
#5 Whiting Cupola—in first class condition
#9 Whiting Cupola—in first class condition
3—R Type Hand Roll Machines.

HAYNES FOUNDRY EQUIPMENT CO.
814 ADA STREET
KALAMAZOO 52, MICH.

FOR SALE

1—6'3" diameter Heroult melting furnace, rated one ton per hour, with holding capacity of 4000/4500#, with motors, roof rings, electrode holders, ladles, etc. and including 1000 kva. 22,000 to 110 volt transformer, 3 phase, 60 cycle. Also includes other electrical equipment ready to set up. Inspection invited. Address: FIRTH STERLING STEEL COMPANY, McKEESPORT, PA.

FOR SALE

One—27" x 36" American Foundry Equipment Wheelabrator complete with motors and loading skip including some spare miscellaneous parts. Excellent condition, about five years old. Price $3,500.00. Available Feb. 1st.

One—No. 4 Model "B" Whiting Cupola complete with spark arrester, roof hood and door lift attachment. Two years old. Price $1,500.00. Available Feb. 1st.

One—No. 4 positive type Root blower complete with V-belt drive and 25 H.P. G.E. Motor and starter. Price $800.00. Available Feb. 1st.

Two—W. W. Sly Tumbling Mills 30" x 48" with jack-shaft. Good condition $250.00 Each. Available now.

One—Nicholls #11-32 Heavy duty combination jolt and power squeezer Molding Machine with pattern draw. Serial No. 41022 Like new. Price $650.00. Available now.

WELLS MANUFACTURING COMPANY
1856 MINER STREET
DES PLAINES, ILLINOIS

FOR SALE

International molding machine described below: Type F, wide model, jolt ram, power turnover, power draw, size 43" x 55" x 16" draw, turnover capacity 3500#, equipped with air flask clamps and air equalizer. Price: $4425.00. Ready for inspection and shipment.

THE MARYLAND CAR WHEEL COMPANY
BALTIMORE 3, MARYLAND

For Sale

EQUIPMENT FOR SALE

MOLDING MACHINES

2—#40 Milwaukee Jolt Rollover Draw Stationary above floor line type.
4—Tabor 22" Portable Shockless Jar Power Rollover Power Draw, Air Clamps, 22"x42" plate, 10" draw.
1—30"x40" Tabor Portable Shockless Jar Power Rollover Power Draw, Air Clamps, 1000# Cap. 12" Draw.
10—International Stationary Type JDP Jolt Ram, Power Lift, 1600# lift cap., 10" lift.
1—International Stationary Type JDP Jolt Ram, Power Lift, 3000# lift cap., 10" lift.
10—Grimes #C-414 Hand Rollover Machines.
1—Arcade Modern No. 2-38 Portable or Stationary Hand operated Squeeze Rollover Draw with swing out table.
5—Mumford 3" Cyl. Core Jolt with 20"x15" table.
2—Tabor Air Jolt, hand rollover, hand draw, Molding Machines, 20"x22" table, 10" Draw.

BLOWERS FOR CUPOLAS & FURNACES

North American 16-Oz. Direct Connected Blowers:
2—30 H.P. 4300 C.F.M.
4—15 H.P. 2100 C.F.M.
2—10 H.P. 1300 C.F.M.
2—7½ H.P. 1050 C.F.M.

Maxon-Premix Blowers for Gas ⅛ to 1 H.P.

METAL MELTING EQUIPMENT

New 32" to 41" dia. shell cupolas made to order.
2—Hausfeld Open Flame Tilting Brass Furnaces, 400" Cap. Gas or Oil.
2—Monarch-Rockwell Rotating 500 lbs. brass. Oil.
1—Iler Aluminum and Bronze Melting Furnace #60 Crucible, oil fired, with blower and motor.

TUMBLING MILLS AND SAND BLAST

4—New Haven 36"x46" Self Contained Sand Blast Barrels, Belt Drive.
2—Pangborn Syphon Feed Sand Blast Cabinets.
1—Battery of two 24"x40" Round Tumbling Mills on common stands. Exh. connections.
1—Battery of two 24"x40" Square Tumbling Mills on common stands. Exh. connections.
1—2000# Cap. V-Bail Worm Geared Crane Ladle.
1—Barrel Type Magnetic Separator—AC driven with DC Generator.
3—Portable Sand Blast generator tanks 500 lbs. sand capacity.
1—4000# cap. Tilting Crane Ladles, V-bail, worm geared.
1—Approx. 8 cu. ft. Tilting Trough type sand mixer.
Air Compressors 1 to 60 H.P.

CLIFTON MACHINERY CO.
1023 W. 6th ST. CINCINNATI 3, OHIO
PHONE PARKWAY 7812

FOR SALE

4—Osborn Jolt Rollover Machines, Serial Number 10216 and 10260.
2—Osborn Moulding Machines, Serial Number 10291.
1—Osborn Jolt Machine, 20" x 27" table.
1—Royer Shakeout Machine with motor. Machine is 64" long and 52" wide with table 29" x 58". Machine used only two months.
1—Sturtevant Blower, Size #45, Serial Number 7641. 16½" inlet and outlet with 8" drive pulley.
1—Hoffman Portable Vacuum Cleaner with 220-440 volt motor; Size PC150, Serial Number 114431. Hose and attachments included. Machine used once and is as good as new.
3—Tabor Jar-Squeeze-Draw Stripping Machines. Will take stripping plates up to 16" wide and 30" long.
1—36" Coombs Gyratory Riddle with 220-440 volt motor, 12 extra ⅜" screens and 1 extra screenholder complete.
15—Ten foot lengths of roller conveyors 18" wide with stands adjustable to a height of 16" to 20". All in excellent condition.
4—Osborn Jolt and Squeeze Machines. Machines numbers 74J and 75J.

OLD COLONY FOUNDRY COMPANY
EAST BRIDGEWATER, MASSACHUSETTS

AIR COMPRESSOR

2190 c.f.m. Ingersoll-Rand type PRE—2 width 350 HP G.E. synchronous motor, 3/60/440 complete with MG set, control panel, after-cooler, and tank. **Three years old.**

FORD-DONLEY
13900 MILES AVE.
CLEVELAND 5, OHIO
PHONE WA 6000

For Sale

FOR SALE

We have the following list of New Sterling Round Flask Sections to offer for sale:

8—Style "BLT" 30 x 8"
8—Style "BLT" 30 x 10"
8—Style "BLT" 30 x 12"
96—No. W-31" Flask Clamps.

8—Style "BLT" 36 x 8"
8—Style "BLT" 36 x 10"
8—Style "BLT" 36 x 12"
96—No. W-31" Flask Clamps.

4—Style "BLT" 42 x 8"
4—Style "BLT" 42 x 10"
4—Style "BLT" 42 x 12"
48—No. W-31" Flask Clamps.

4—Style "BNT" 48 x 10"
4—Style "BNT" 48 x 12"
32—No. W-33" Flask Clamps.

We have the following list of New Circular Flask Plates to offer for sale:

8—30" Flask—32" Rd. Plate ⅜" Thick Angles 2½ x 2½ x ⅜"
8—36" Flask—38" Rd. Plate ⅜" Thick Angles 2½ x 2½ x ⅜"
4—42" Flask—44" Rd. Plate ⅜" Thick Angles 3 x 3 x ⅜"
4—48" Flask—51" Rd. Plate ⅜" Thick Angles 3 x 3 x ⅜".

FARRELL-CHEEK STEEL CO.
SANDUSKY, OHIO

FOR SALE

Immediate Delivery
Excellent condition. Available for inspection at our plant
7½ Ton Northern Crane 26' 7½" span with runway 123' long
Geared ladles—one 1½ ton—one 2 ton—one 4 ton—one 15 ton—two 25 ton capacities
1—P & H bucket
2—Cupola charging buckets 42" diameter x 45" high
2—5 H.P. Core Oven Blowers
1—10 H.P. Core Oven Blower
Air rammers and chipping guns

LAKE ERIE ENGINEERING CORP.
BOX 68, KENMORE BRANCH
BUFFALO 17, N. Y.

FOR SALE

1 10-ton Northern Overhead Foundry Crane, 50 ft. span, 215-230 Volts DC with generator set.

1 6-ton Northern Crane, 46 ft. span, Floor-controlled, 215-230 Volts D.C.

1 Ingersoll-Rand Steam Air Compressor, Steam Cylinder 10 x 10, Air Cylinder 12 x 10. Serial No. 34862.

1 Herman Jolt Rollover Machine, Size 40" x 72".

3 Core Oven Cars, apprx. 6' x 9' for 58" Gauge Track.

9 9" I-Beam Jib Cranes—Can be fastened to columns.

LAVELLE GRAY IRON FOUNDRY CORP.
ANDERSON, INDIANA

FOR SALE

General foundry equipment including 4½ year lease, 3 jolt squeeze machines, compressor, screenerator and snaps. Cast up to 600 pounds. Address: Box 139, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

For Sale

OVERHEAD CRANES

1-Ton
Whiting 33′ Span
Curtis 24′ Span
1½ Ton
Shepard Niles 25′6″ Span
P & H 34′ Span
2-Ton
Louden 19′2″ Span
Box 36′9″ Span
Detroit 28′ Span
3-Ton
Shaw 33′ Span
P & H 25′ Span
Northern 22′ Span
Manning, Maxwell & Moore 48′¾″
"Conco" 48″ and 26′6″ Spans
5-Ton
Whiting 47′4″ Span
38′10½″ Span D.C.
Northern 30′9″ Span
Milwaukee 70′ Span
Milwaukee 66′9″ Span
Manning, Maxwell & Moore 70′ Span
Manning, Maxwell & Moore 47′4″ Span
Shaw 36′ Span
Champion 37′6″ Span
American 70′ Span
American 47′4″ Span
6-Ton
P & H 77′ Span
American 77′ Span
7½-Ton
Shepard 36′ Span
10-Ton
Shaw 68′ Span
Shaw 73′ Span
P & H 30′ Span
P & H 87′6″ Span
P & H 80′ Span
Northern 71′10¼″ Span
Northern 60′ Span
Morgan 55′6″ Span
Morgan 39′5″ Span
Morgan 52′3″ Span
Milwaukee 66′9″ Span
McGill 85′ Span
Lane 50′ Span
Emsco 75′ Span
Dominion 35′ Span
Cleveland 38′1½″ Span
Cleveland 50′ Span
Alliance 71′10½″ Span
Alliance 58′9″ Span
Albany 60′ Span
15-Ton
Whiting 71′10½″ Span
Northern 53′ Span
Erie 60′ Span
Chesapeake 55′6″ Span
Case 51′ Span
20-Ton
Shepard Niles 49′6″ Span
P & H 51′4″ Span
Northern 60′ Span
Morgan 60′ Span
Cleveland 65′ Span
25-Ton
Whiting 106′ Span
Tysaman 60′ Span
P & H 70′ Span
Morgan 52′3″ Span
Cleveland 106′ Span
Case 63′ Span
Bedford 50′ Span
30-Ton
Whiting 80′ Span
P & H 80′ Span
P & H 60′ Span
Morgan 30′ Span
Case 41′ Span
35-Ton
Bedford 50′ Span
Northern 22′ Span
50-Ton
Shaw 95′ Span
Shaw 69′10″ Span
Dominion 80′ Span
Cleveland 71′10⅛″ Span
75-Ton
Morgan 59′2½″ Span
Alliance 78′ Span
Alliance 37′ Span
80-Ton
American 40′6″ Span
125-Ton
Morgan 100′ Span
150-Ton
Whiting 30′ Span
175-Ton
Morgan 54′ Span
200-Ton
Alliance 100′ Span

Telephone us collect to discuss your requirements.

ECONOMY CO., INC.
49 VANDERBILT AVENUE, NEW YORK 17, N. Y.
Telephones: MUrrayhill 4-2294, 4-2893, 4-2295, 4-2844, 4-2296, 4-3292

CUPOLA BLOWERS FOR SALE

33 C.F. Connersville 4 Bearing Rotary Positive Blower, 60″ barrel length, 20″ dia. outlet & intake. Arr. for m.d.

16.2 C.F. Connersville 6 Bearing Rotary Positive Blower, 27″ barrel length, 12″ dia. outlet & intake Arr. for m.d.

14.2 C.F. Connersville 4 Bearing Rotary Positive Blower, 30″ barrel length, 12″ dia. outlet & intake. Arr. for m.d.

Also centrifugal blowers.

Complete list on request.

INDUSTRIAL PLANTS CORPORATION
316 S. LASALLE ST.
CHICAGO 4, ILLINOIS

FOR SALE

1—Ransohoff Water Mill 36 x 60 side loading and end loading. Automatic star separation and star return. Complete with direct drive and in good condition.

1—405 Osborn Jolt Roll-over pattern draw; jolt cylinder 12″ dia. Pattern draw 18″ max. flask limit 64″.

1—46″ dia. x 56″ inside length tumbling barrel.

1—Battery of four 24″ x 54″ tumbling barrels.

2—30″ x 52″ tumbling barrel only.

1—30″ x 38″ tumbling barrel only.

4—18″ x 52″ tumbling barrel only.

BOX 635
The FOUNDRY CLEVELAND 13, OHIO

FOR SALE

New heavy duty motorized rod cutter, 65 cuts per minute; capacity: ¾ inch round hot rolled steel. Brand new. $890.00 f.o.b. Cleveland. Address: Box 772, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

One Robins portable shakeout and sand riddle, 3 ph. 60 cy. 220 v. NEW, original guarantee. Address: HILLSDALE FOUNDRY CO. INC., HILLSDALE, MICHIGAN.

FOR SALE

1—Whiting cupola 56″ diameter shell with Wilbraham Green rotary positive pressure blower. Dismantled. Price $2000. Address: NATIONAL PLUMBING FIXTURE CORP., ELLWOOD CITY, PA.

FOR SALE FAR BELOW VALUE

2 Campbell-Hausfeld stationed furnaces for aluminum, capacity 500 lbs. with all necessary attachments, also heat and metal control equipment on each furnace. Can be used for gas and oil heating and will be sold for $290.00 per furnace. This equipment has been in operation for only three months.

KENT FOUNDRY COMPANY
DIV. OF KENLEE CORP.
CORTLANDT & TERRY STS.
BELLEVILLE 9, N. J.

CORE PLATES FOR SALE

All steel-ribbed—some cast iron. Miscellaneous sizes. Must sacrifice the lot.

WAYNE FOUNDRY CO. 3100 HUBBARD AVE.
DETROIT 10, MICHIGAN

FOR SALE

Cast iron heating boiler patterns and flasks and other equipment of well-known manufacturer.

ACRON IRON & SUPPLY CO.
915 N. DELAWARE AVE.
PHILADELPHIA 23, PA.

FOR SALE

•Sly S. B. Cabinet Type A 36″ x 60″ with No. 11 Dust Hopper, motor exhaust.
•Purchased new 1944.

N. P. NELSON IRON WORKS, INC.
820 BLOOMFIELD AVE.
CLIFTON, N. J.

FOR SALE

Northern overhead crane, 15 ton, manual operated, 44½ ft. span, 90 ft. runway.

ABBOTT SALVAGE COMPANY
1087 CLINTON ST.
BUFFALO 6, N. Y.

SPEEDMULLER

Beardsley Piper type $80. Capacity 50 TPH with 125 HP motor, 3 PH, 60 C. One year old. Excellent condition.

NEW YORK CAR WHEEL COMPANY
15 FOREST AVE., BUFFALO, N. Y.

METAL RECLAIMING MILL

No. 5 size, used, in good condition, with extra set of manganese cast steel crushing rolls. Operated for about four years and replaced with a larger size. A good buy.

DREISBACH ENGINEERING CORP.
85 WARBURTON AVENUE YONKERS 2, N. Y.

FOR SALE

38 Like New Adams Cherry Straight Snap Flasks
11, 12, 13 x 14—13 x 15—12, 14 x 16
12, 13 x 17—13, 15 x 18—13 x 13 . . ⅓ Price
15 4′ Wide x 6′ High x 6′ Deep Core Racks Used 6 months . . . . . $50.00 ea.
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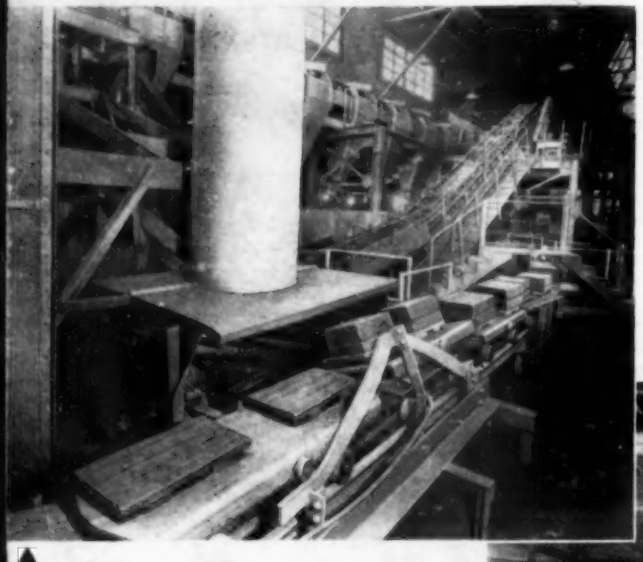

▲ Showing automatic mold discharge mechanism on Link-Belt Tru-Trac mold conveyor. Requires no attendant at the shakeout position.

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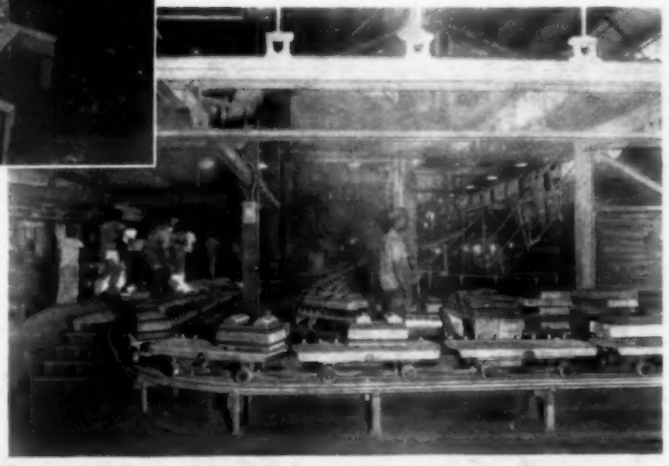
Another view of Tru-Trac mold conveyor at Wagner Malleable Iron Foundry showing pouring zone and man shifting weights and jackets. ▶



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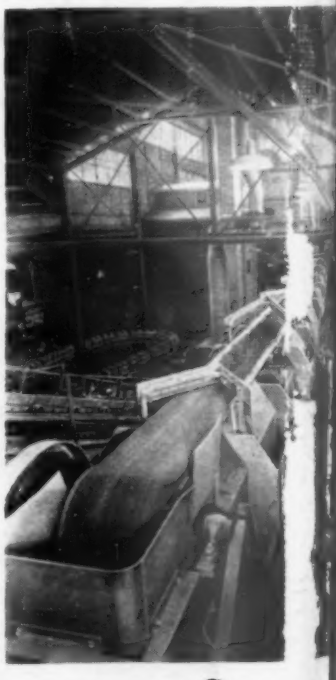

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